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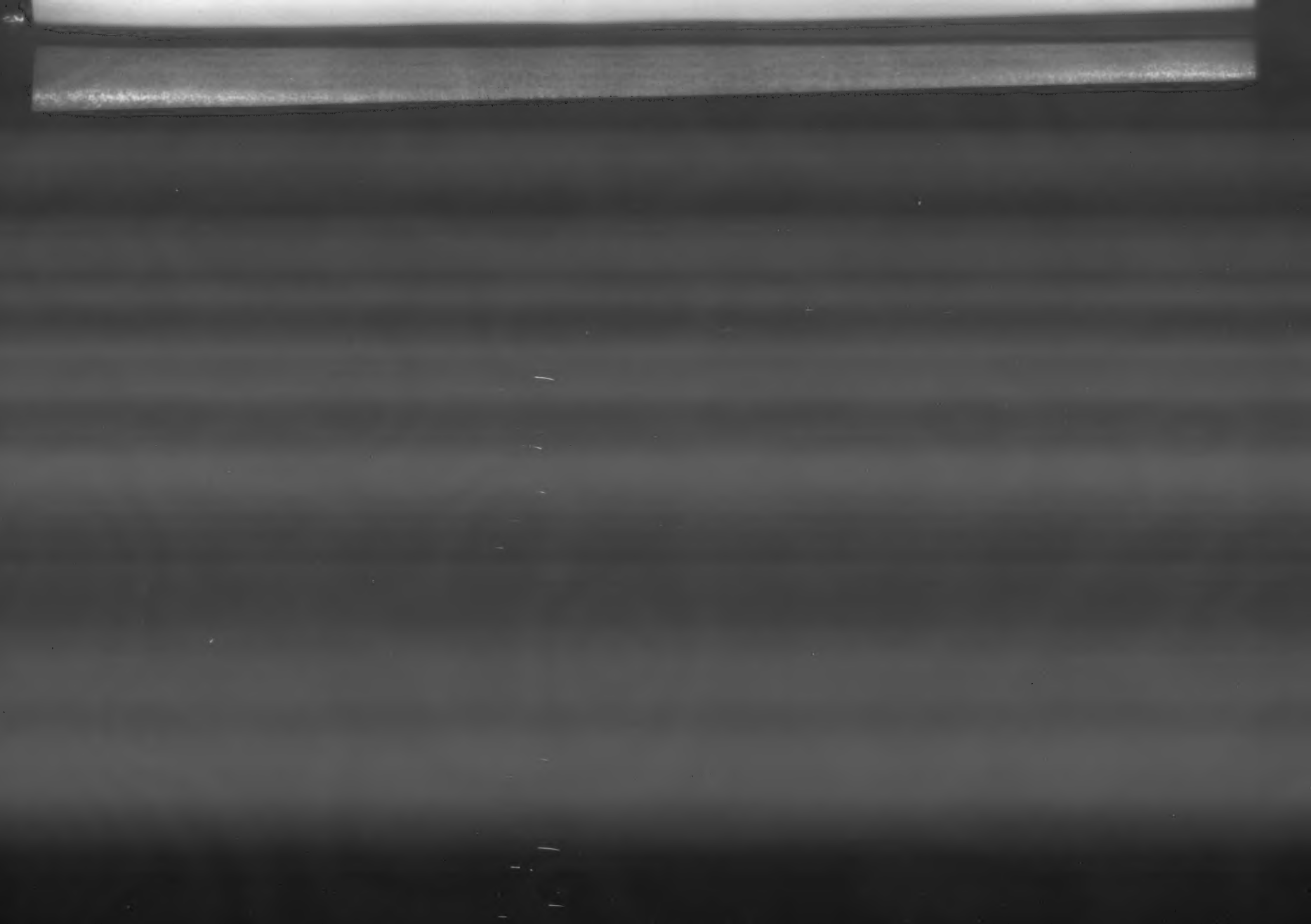


MUNICIPAL ENGINEERING

VOLUME XXVI APRIL, NINETEEN HUNDRED FOUR NUNBER FOUR

PORTLAND CEMENT MANUFACTURE.*

CLINKER GRINDING. GYPSUM.

By E. C. Eckel, U. S. Geological Survey, Washington. D. C.

Clinker Grinding—The power and machinery required for pulverizing the clinker at a Portland cement plant using the dry process of manufacture is very closely the same as that required for pulverizing the raw materials for the same output. This may seem, at first sight, improbable, for Portland cement clinker is much harder to grind than any possible combination of raw materials; but it must be recollected that for every barrel of cement produced about 600 pounds of raw materials must be pulverized, while only a scant 400 pounds of clinker will be treated and that the large crushers required for some raw materials can be dispensed with in crushing clinker. With this exception, the raw material side and the clinker side of a dry-process Portland cement plant are usually almost or exactly duplicates.

The difficulty and in consequence the expense of grinding clinker will depend in large part on the chemical composition of the clinker and on the temperature at which it has been burned. The difficulty of grinding, for example, increases with the percentage of lime carried by the clinker; and a clinker containing 64 per cent of lime will be very noticeably more resistant to pulverizing than one carrying 62 per cent of lime. So far as regards burning, it may be said in general that the more thoroughly burned the clinker, the more difficult it will be to grind, assuming that its chemical composition remains the same.

The tendency among engineers at present is to demand more finely ground cement. While this demand is doubtless justified by the results of comparative tests of finely and coarsely ground cements, it must be borne in mind that any increase in fineness of grinding means a decrease in the product per hour of the grinding mills employed; and a consequent increase in the cost of cement. At some point in the process, therefore, the gain in strength due to fineness of grinding will be counterbalanced by the increased cost of manufacturing the more finely ground product.

The increase in the required fineness has been gradual but steady, during recent years. Most specifications now require at least 90 per cent to pass a 100 mesh sieve; a number require 92 per cent; while a few important specifications require 95 per cent. Within a few years it is probable that almost all specifications will go as high as this.

Addition of Gypsum—The cement produced by the rotary kiln is invariably naturally so quick-setting as to require the addition of sulphate of lime. This substance when added in quantities up to 2½ or 3 per cent retards the rate of set of the cement proportionately, and appears to exert no injurious influence on the strength of the cement. In amounts over 3 per cent, however, its retarding influence seems to become at least doubtful, while a decided weakening of the cement is noticeable.

Sulphate of lime may be added in one of two forms: Either as crude gypsum or as burned plaster. Crude gypsum is a natural hydrous lime sulphate, containing about 80 per cent of lime sulphate and 20 per cent of water. When gypsum is calcined at temperatures not exceeding 400 degrees F., most of its contained water is driven off. The "plaster" remaining carries about 93 per cent of lime sulphate, with only 7 per cent of water.

*Published by permission of the Director, U. S. Geological Survey.

In Portland cement manufacture either gypsum or burned plaster may be used to retard the set of the cement. As a matter of fact, gypsum is the form almost universally employed in the United States. This is merely a question of cost. It is true that, to secure the same amount of retardation of set, it will be necessary to add a little more of gypsum than if burned plaster were used; but, on the other hand, gypsum is much cheaper than burned plaster.

The addition of the gypsum to the clinker is usually made before it has passed into the ball mill, komminuter or whatever mill is in use for preliminary grinding. Adding it at this point secures much more thorough mixing and pulverizing than if the mixture were made later in the process. At some of the few plants which use plaster instead of gypsum, the finely ground plaster is not added until the clinker has received its final grinding and is ready for storage or packing.

CONCRETE WORK IN CUBA AND YUCATAN.

By C. E. McDowell, Newark, N. J.

Concrete construction of buildings in tropical countries has existed for centuries, but took the form of adobe rather than the scientific processes of today. The native rock, as well as the sand used, was of a limestone nature. When put in one and two story buildings, erected and left undisturbed, they would last for centuries. We show in our sketches concrete work in Havana, Cuba, and street work in Merida, Yocatan. There is but one cement factory in Cuba. This is situated on the Almendares River, some five miles from Havana on the west. The cement is a Portland made from rock found at Regla, across the bay from Havana. American cements like the Atlas, Alpha, Lehigh, Vulcanite, Giant, Universal and other well-known brands, demand the trade for first-class work. The Cuban engineer and builder, clannish to a high degree, uses the Almendares brand to a large extent. Most of the improvements during the time of the United States army of intervention in Cuba were made with American cement. These represented a large expenditure of money and as great care was used in the construction, the work as a whole was very satisfactory.

The first view shows Campo Florida station, fifteen miles from Havana on the United Railway of Havana running to Matanzas. It is a sample of concrete stations proposed for this line and was built in 1900. The material, used in the proportions of 1, 2 and 5, consisted of imported Portland cement, calcareous sand from a nearby river, and coral limestone found nearby. The railroad company is controlled by English capital and is in charge of English engineers. The work is not of a high character, but is a vast improvement on all dono before. The station is a very important one, being in the midst of a large dairy and agricultural district near Havana.

Venta Springs are said to be the greatest springs in the world, supplying as they do the City of Havana with 40,000,000 gallons of the purest water daily. They are ten miles south of Havana and reservoir and aqueduct lines to the city were most carefully guarded by the Spaniards during the last war. The source of supply consists of some 400 springs corraled in the reservoir, shown in the second view, and carried through a brick masonry oval-shaped aqueduct six miles long to the reservoir and gate house, shown in the third view. Meagre description as to the receiving reservoir at Venta Springs is to be had. It is a solid masonry and concrete basin some 150 feet square and 40 feet deep, faced with a sand-lime coating, which has stood secure since its completion in 1872, when it was connected by the aqueduct to the old city system. The records say that up to 1887 the work had cost $3,500,000.

The third sketch shows the Palatino reservoir and gate house. In 1889, thirty years after its inception, the new reservoir and gate house at Palatino, near Havana, was instituted by American engineers and pushed to completion in 1893, when the inauguration of the same took place by the Captain General of Cuba and Bishop of Havana. The reservoir and gate house are all of heavy masonry and concrete and cost $566,486.51. From outside to outside of foundation is 245 by 500 feet, and 20 feet high, and covers nearly three acres. The reservoir will hold 8,000,000 gallons. It has an elevation of 100 feet above Havana. From the records we gather:

The concrete bottom of the Palatino

reservoir is one foot thick, laid in two courses of six inches each. This formed a volume of concrete, in all about 5,500 cubic yards, to be spread in so thin a sheet on so large an area, and great care was necessary in preparing the ground for its reception. The specified thickness was obligatory and on the other hand no extra thickness would be paid for.

The stone mostly used for this concrete was in every respect admirably adapted for the purpose, being an exceedingly hard crystalline limestone breaking readily in a crusher with a sharp conchoidal fracture. The sand was calcareous, there being no silicious sand procurable. It was sharp, very clean and gave excellent results. The keeping of the concrete thoroughly wet for long periods of time after being placed was inflexibly insisted upon. The precaution was doubly necessary in such a climate as that of Cuba and was enforced for all classes of masonry.

The inside faces of the reservoir walls were plastered with one part cement, one part sand and one part lime. It stood well, however. The floor of the reservoir was finished with a plastering of one part cement and two of sand. After the resumption of work (August, 1891) the center wall was built as well as the influent and effluent gate chambers. This last was an extensive and imposing structure. It composed of much cut stone work as well as concrete.

The fourth sketch shows the top of the main tower of Mme. Rosalie de Abreux's concrete chateau at the Kina de Delicias on the Palatino road, some three miles from Havana. A fire destroyed her home in 1900 and so a contract was made with the Cuba Supply Company to erect a concrete building on the Ransome system to cost $100,000. The method of construction can be stated in a general way by saying that the walls inside and out, all floors and towers, are built under the Ransome system. The concrete used was very rich and consisted of the imported American cements, Alpha and Atlas; beach sand, (calcareous) from Bacharhanoa; and broken limestone from the Cuban Quarry Company's quarry at Jesus Del Monte near Havana. All of the concrete was kept thoroughly wet for thirty days while setting and so no cracks appeared. The main tower is 80 feet high with 12-inch walls at the base and 8 inches at top. The location is an ideal one, situated as it is on high ground in the midst of a beautiful tropical garden at the end of the noted Palatino road, one of the finest drives in Havana. It is a landmark for miles around.

I. CAMPO FLORIDA STATION, NEAR HAVANA, CUBA. CONCRETE.

The fifth view shows the laying of concrete sidewalks and brick paving on concrete base in Merida, Yucatan. This is the forerunner of sidewalk and street work destined to cost $1,500,000 to $2,000,000. The brick used are the metropoli-

tan block from Canton, O. They are laid on a 5-inch concrete base made in proportion of 1, 3, 7, and finished with pitch joints. The stone used in the concrete is the native limestone, fairly hard and broken fine, ¼ inch to 1½ inches. The sand is calcareous in nature and comes from the beach at Progresso, 25 miles away. Giant cement was used in completing the mixture and the result was very satisfactory. In the sidewalks the same material was used, but in proportion of 1, 2, 5, and the top finished one to one, with a rough surface, and bound on the curb front with an iron face set in the concrete, under the Wainwright system. The sidewalks were laid in advance of the street work and are very irregular in width, covering as they do from the curb line to the fronts of the adobe houses, of which the whole city of Merida, Yucatan, is built. The effect of all this street work is to change the appearance of this 400-year-old city and to advance it along the line of civilization and progress a hundred years.

In all our sketches improved American cements have been largely used and the demands are constantly increasing. Modern American contruction is the ideal form for all of these southern countries. Some day a good native Portland cement rock will be found that will help construction work. In the meantime American engineers, architects and builders, are looking southward for business opportunities where brains and capital are needed to bring out first-class concrete construction work. The examples of work shown are evidence that the tendency is toward good work, equal to most of that in the United States.

WASTE UTILIZATION.

The title of this article suggests the treatment of municipal waste in such manner as to utilize the product of the process and thus save the valuable elements. An excellent system of reduction by cremation was described in the January number of Municipal Engineering, and some description of an English installation upon the same principle will be found elsewhere in this number. There are many reduction plants in this country which extract from the garbage all kinds of valuable products, and which seem to be operated at a good profit under the contracts of their owners with the respective municipalities.

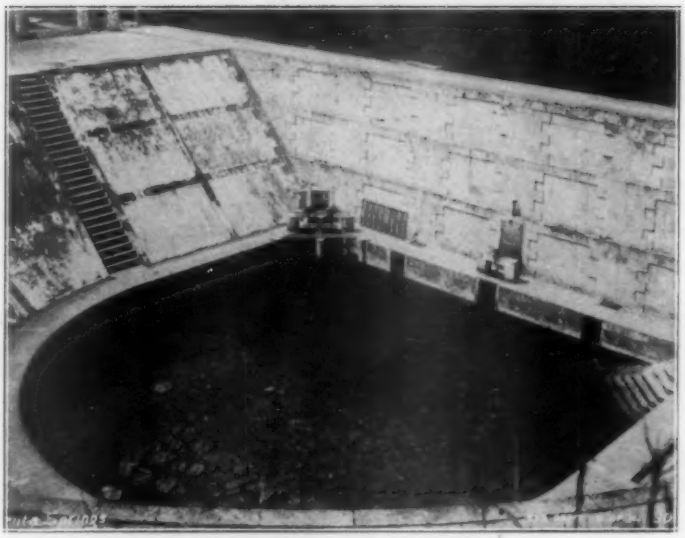
There is in operation one system which is a combination of the cremation and reduction processes. Mr. F. G. Wiselogel, the inventor of the process, describes the plant and the method of operation in a paper from which the following abstract is taken:

By this system all material, dead animals, etc., is taken to the top floor of the plant, the hides are taken off the dead animals in a room especially prepared for this purpose and provided with a powerful fan to exhaust the air constantly, thus insuring an inward draft. The air from this room is blown into the boiler furnace and passed through the fire.

The carcass, after being skinned, is cut into suitable pieces and thrown into a receiving and reduction tank, to which an air-pump is attached, which, being kept constantly in motion, causes an inward draft to the tank as long as the door is left open. When the tank is full the door is closed and bolted and its contents cooked under vacuum. When sufficiently cooked the mass is allowed to settle and the grease is drawn off. This done, the tankage is subjected to a special treatment to extract the balance of the grease still mixed with it. The tankage is then dumped through a suitable pipe into the dryer below, without being exposed to the air or sight and is dried under vacuum with steam heat. When dry it is dropped into a conveyor, which conveys it to an elevator, which in turn delivers it into a revolving screen, from which the fine particles are spouted or conveyed into the shipping room, while the coarser parts that will pass through the coarse part of the screen fall into the mill to be ground to proper fineness, and are spouted into the conveyor, elevator and screen to land in the shipping room.

The large parts, bones, hoofs, tin cans, rags, etc., go out at the end of the screen as tailings and drop through a spout into a suitable bin.

The garbage, kitchen slops, butchers' offal, decayed vegetable or animal matter, etc., are hauled to the top floor and dumped directly into the tank without sorting or exposure and are treated the same as the animal matter. The whole operation is practically automatic and sanitary, with no possible chance for any odors to escape, as the air pumps pass



II. VENTA SPRINGS. HAVANA WATER SUPPLY. CONCRETE, BRICK AND SAND-LIME.

III. PALATINO RESERVOIR AND GATE HOUSE. CONCRETE AND MASONRY.

all the vapors and gases emanating from the material in process of reduction and drying through proper condensers that condense all the vapors and pass the effluent through a sanitary filter bed into a cistern or sewer. The uncondensed foul air or gas is led in iron pipes into cast iron retorts walled in the boiler furnace and is there burned.

The dry waste, such as paper, paper boxes, rags, etc., is received in a room set apart for this purpose, where the different grades are separated and baled for shipment, while the other waste, such as floor sweepings, shavings, dry stable manure, yard cleanings, tree trimmings, wood, etc., is burned in a patented furnace attached to the boilers to help in generating the steam required to operate the plant.

The night soil, cesspool matter, wet manure and all kinds of foecal, animal or vegetable matter are taken to the top floor and thrown into the digester, then treated to a proper amount of acid to destroy any disease germs that may be in the mass, which is then dried under vacuum with steam heat at 350 degrees F. The digesters, like the tanks, are provided with air pumps, condensers and gas separators, connected with the filter bed and gas retorts in the boiler furnace.

The coal ashes are received on the top floor and thrown into hoppers connecting with suitable screens and separators. The ash goes into a suitable room to be mixed with cement and pressed into brick or used in plastering. The clinkers, mixed with cement, make excellent concrete, while unburnt coal or coke is used for fuel to make the steam to operate the plant.

All the floors, except the shipping room floor, are of concrete, pitched to a center drain. The inner sides of the walls and partitions are coated with an adamantine paint so there can be no absorption of bad odors. Plenty of water must be used to keep the floors, walls and apparatus thoroughly washed and clean to insure its sanitary condition at all times.

The products, such as grease, oil, hides, bones, tankage or fertilizer stock, paper stock, cement brick, clinkers, etc., find ready sale, while the unburnt coal, mixed with the other waste burned in the improved furnace, makes more steam than is required to operate the plant.

All material being received on the top floor, it flows by gravity to the bottom in the process of reduction and drying and lands in the shipping room an odorless and absolutely sterile product ready for the market. The apparatus, being powerful and especially designed for this business, makes the sorting of the garbage and consequent exposure in the plant unnecessary, as the tin cans, etc., are taken out by the machine automatically and dumped into the proper bin.

This is a concise description of the Wiselogel system of waste utilization, which is the result of nearly thirty years of study and experience in construction and operation of plants and many costly experiments. It has advanced by slow degrees and, owing to the first cost of former plants, it has been kept out of the general market except in large cities. Recent inventions and improvements have reduced the first cost of plant one-third and the cost of operation and reduction one-half, and it can be made profitable in small cities of 12,000 inhabitants as is shown by the latest plant of this system, the Star Tankage and Fertilizer Works of Vincennes, Ind.

ELECTROLYSIS NOT A NECESSITY.

By A. Ross Gray, Bradford, Pa.

The protection of water works distributing systems from destruction by electrolytic action has never received the careful attention which the importance of the question demands. In all our cities the water pipes are being damaged to a very much greater extent than is realized by those in charge. It is true that in a great many cities, surveys have been made and reports written setting forth the damage that is being done and calling attention to the dire results that will follow at some future time if the trouble is not remedied, but in no case, I believe, has the engineer making such report offered any satisfactory method for the complete elimination of the trouble.

The theory is constantly advanced by men supposed to be authorities on the subject, that as long as single trolley systems of street railways are in operation, underground piping systems must necessarily suffer to a great extent from electrolysis. I think electrical engineers have

IV. TOWER OF MADAME ABREUX'S HOUSE, HAVANA. CONCRETE.

V. CONCRETE SIDEWALKS AND BRICK PAVING. MERIDA, YUCATAN.

agreed so generally upon this theory for two reasons principally: The first that the destruction of piping systems by electrolytic action is comparatively a new phenomenon, the protection of piping systems from it a new problem and one with which a large majority of the engineers are not familiar except in a theoretical way, having no occasion to make a careful study of the problem under actual conditions; the second, that the principal employers of engineers meeting these difficulties are the street railway and power companies. The piping system of any city offers a convenient return for the current of a street railway and as long as it remains a good return is the means of saving the railway company large amounts of money which otherwise would of necessity be invested in copper returns, and which copper if installed would not return the current as well as the piping system does. This is especially true in cases where the water department of a city has been led to believe that, if the piping system were connected to the track returns of the railway company or to the negative bus bar at the power station by a return feeder, all trouble from electrolysis would be at an end. Such connections are of great advantage to the railway company, because they reduce the resistance offered to the current by the ground between the pipes and the power station, and by reducing such resistance secure a larger flow of current on the pipes than could otherwise be obtained. Such connections are, however, the means of increasing the electrolytic action on the piping system a hundred fold.

It is maintained by many that the current is all taken from the pipes by means of such connection and that when this is the case no electrolytic action takes place. If the current were all taken from the pipes by such connections it is undoubtedly true that no action would result, but unfortunately the current is not all carried off by the connections. If the cross sectional area of iron in an entire piping system is calculated and compared with the cross sectional area of copper which is installed by the railway to take current from the pipe, making due allowance for the difference in the conductivity of the two metals, it will readily be seen that all of the current carried by the pipes cannot be taken off by copper returns as they are usually installed in such cases.

Again, no one will question that the extent of disintegration by electrolytic action is directly proportional to the amount or quantity of current flow, other conditions being equal. This being true, is it logical to suppose that the adoption of a plan whereby the amount of current flow is increased 100 per cent is the only means of protection which should be considered for a piping system? Does it not seem that such method of protection is a benefit to the street railway rather than to the piping system? Yet our water distributing systems are being daily connected by return feeders to tracks and to power stations. Does it look reasonable to expect to reduce the damage by increasing the cause of it? Yet this is the result of connecting pipes to a return feeder of any description.

Does it not seem reasonable to maintain that the only logical means to do away with the trouble is to eliminate the cause? In other words, deal with that which produces the trouble, instead of trying to deal with its effect? If it is true that the extent of electrolytic action is due to the amount of current flow, why not adopt a plan whereby this amount is decreased instead of increased? If such a plan is possible why do electrical engineers and the street railway companies not adopt it? Simply because for every ampere of current which is prevented from returning over a piping system the railway must invest in copper to supply a return of its own, and if the entire piping system of a city is so treated that it will not carry current the street railway company must invest thousands of dollars for copper to do the work which the piping systems are now doing. The use of return feeders has been tried times without number and the case is yet to be found where the electrolytic action has been lessened to any extent.

The almost universally accepted theory, which originated when we knew a great deal less about electrolysis than we do now, and which is being constantly harped upon by the railways today, viz: That electrolysis as affecting piping systems cannot be stopped and that the damage must go on, is a fallacy. Electrolytic action can be entirely eliminated in any underground piping system by the intelligent use of insulating joints placed at intervals in the pipes. The writer has had the supervision of the installation of insulating joints in numerous entire piping systems, containing from 25 to 300 miles of pipe, some of them in localities where the conditions were the worst that could be met. The result obtained in every case has been the entire elimination of all electrolytic action. These piping systems are open to the inspection of any who are interested in the question of protection from electrolysis, and the results

obtained are there to show for themselves.

If some radical change is not made by our cities in their method of dealing with this problem, during the next ten years will be noted the serious impairment of whole plants, necessitating the reconstruction of distributing systems at a cost many times greater than would be necessary to secure ample protection if applied before the damage becomes too serious.

It is of vital importance that piping systems in localities where street railways are operated should be thoroughly investigated to determine how severe the conditions are and that immediate steps be taken to secure adequate means of protection before the damage reaches a serious point. It is not safe to wait until the destruction that is going on becomes all too evident by the giving out of pipes during a critical time as that occasioned by a bad fire.

THE INDIANA STREET IMPROVEMENT LAW.

By C. A. Kenyon, Indianapolis, Ind.

The rapid growth of our towns and cities may be attributed to the progressive thought and restless energy of the American citizen. The progressive man wants to see his home town enjoy electric light, sewers, pavements, a police force, a fire department, during his lifetime. He is not content to say I will help build the sewers, and my children will help pave and their children will help pay for lights and fire protection. On the other hand there is a very active and noisy minority who do not want to pay taxes, do not want improvements.

The present constitution of the State of Indiana prohibits municipalities going into debt in excess of 2 per cent of the assessed valuation of the property within the municipality. This clause is a great restraint to the ambitions of the progressive class, and often is a distinct hindrance to the advance of a rapidly growing town or city. Again it has some advantages in that it will prevent public officials from indulging in ruthless extravagance. The 2 per cent limit is, however, so low that nearly every town and city in the State of any size is close to or beyond its legal limit of indebtedness, from sheer necessity.

Many people believe in and still advocate the old system of making public improvements, namely; pay for them out of funds raised by general taxation. Under our constitution, if this were the law there would be practically no improvements.

To meet the progressive idea the modern street improvement laws were devised, under which the cost of the improvements, sewers and pavements are paid for by the property benefited, in ten annual installments, represented by street improvement bonds, which bonds are not a part of the municipal indebtedness and hence not subject to the 2 per cent limit rule.

What is known as the Barrett Law was passed in 1889 by the Indiana Legislature, and under it the cities and towns of the State made such rapid progress that other States rapidly passed similar laws, with similar results. When the United States Supreme Court, a few years ago, decided the case of the village of Norwood against Baker, many lawyers thought it invalidated the Barrett law, and the Legislature of 1901 hastened to repeal it as to cities, by passing what is known as the Artman law, which was vastly inferior to the Barrett law in many vital respects, and it is to some of the defects of the Artman law that I desire to call attention.

1. An ideal street improvement law should be so simple and clear that an ordinary mind could understand it. The Artman law is so involved and complicated that no two lawyers construe it alike.

2. The property-owner whose land is to be taxed to pay for the improvement should have a right to be effectively heard, and if enough of his fellow owners should join in insisting that no improvement should be made then their protest should be effective, unless some urgent public demand or necessity for the improvement exists.

3. When it shall be decided to do the work, and its nature and character are determined, then all contests should be at an end. These applications should be carefully and accurately drawn, so that contractors may know exactly what they are bidding on and that when their work is completed they will surely get their pay without discount, delay, hold-up or quibble. There should be no chance at this time for the property-owner to con-

test the matter except on one ground, to-wit., that the work was not done according to contract; and even this should be raised while the work is in progress.

If contractors know that they will get their pay as soon as the work is done according to contract in cash, or bonds that are at once as good as cash, they are in a position to offer very much lower prices, and competition will be sharper. On the other hand, if the contractor is filled with doubts as to when he will get his pay, as to whether he will ever get his pay, as to whether he can sell his street improvement bonds when he gets them or must sell at a ridiculously low price on account of some foolish provision that in no way benefits the property-owner, so that all his profit is gone, and a loss is entailed, the result is that the next time he bids much higher to provide for these things.

In my opinion the Artman law has about all of these defects. There is no serious objection to the advertisement and letting of the contract, although the property-owner could be given more rights. It is after the contractor has completed his work that his trouble begins.

The engineer measures up the work, finds it all right, computes the total amount due the contractor, and reports it to the Council; the law does not say when, but he usually does it in a reasonable time.

Then the Council can dally with the estimate as long as they see fit, without the contractor being able to help himself. I have frequently known it to be more than a month.

They then accept it, and refer it to the city commissioners, fixing a day for them to meet, and the city marshal notifies the city commissioners. They may take fifteen days to decide the names of the owners and the property that will be benefited by the improvement. (One day would be enough.)

They then report this to the Council, (what for no one has ever been able to definitely find out), who may let one or a dozen meetings elapse before acting on it, then only to report it back to the city commissioners, fixing a day and place for them to meet and notifying the property owners by advertisement that they may go before the commissioners on that day and be heard.

After the hearing the commissioners may take days to make the assessment of benefits and damages, and more days to report it back to the Council, and the Council may delay action on it indefinitely, but finally they advertise again telling the property owners that on another day fixed they may have another hearing before the Council.

That hearing ended, the Council may take it under advisement indefinitely before confirming the assessment.

Finally they confirm the assessment, but after that any property owner who considers himself aggrieved may within twenty days appeal the whole matter to the Circuit court, where it may drag from three months to a year, the poor contractor out of his money and paying interest on his loans, being pressed by his banker, and no interest accruing on the amount due him.

Finally, if not entirely defeated on some technicality, the assessment is made, whether appealed from or not, and the assessment roll goes to the treasurer.

The property owners may at once pay in cash, which, by the way, few of them do. And then the Council must pass a bond ordinance. The lawyers do not agree as to how this should be drawn, and the contractor has to take his chances. At any rate after a time it is passed and bonds are issued and given to the contractor. Seldom does he get them within four months and frequently a year elapses from the time he finished his work according to contract. They are issued to him at par.

The city is through, but the contractor goes to his banker, who does not want them.

1. Because they only bear 5 per cent interest when he can keep his money loaned on short time paper at from 6 to 8 per cent.

2. One-tenth is payable each year and any property-owner may pay his entire assessment at any time without notice.

3 If any property-owner on the entire improvement fails to pay his installment of interest or principal promptly each year as it falls due, the bondholder finds such coupons returned to him unpaid and he must go and look up the delinquent party and institute a foreclosure suit to get his money.

4. He must pay taxes on them while city bonds escape taxation.

The contractor finds he cannot sell them or if he does he must make the large discount the broker exacts.

It would be difficult to make a worse arrangement than the above and yet it is literally true. The property-owner loses in the end. The contractor gets caught once. The next time he increases his bid to provide for delays and contingencies. I believe that the Artman law

has cost the people in the short time it has been in operation hundreds of thousands of dollars, by reason of extra cost of work, and this is increasing.

Can anyone suggest the use of all those notices and references back and forth between the Council and the City Commissioners, with the numerous publications, all of which have to be paid for by the property-owners?

If a property-owner stands by and sees an improvement completed in front of his property, why should he afterwards be heard to say it is illegal, he will not pay for it, yet he will keep the improvement?

In no State in the Union have street improvement bonds, that only bear 5 per cent interest, such as are issued under the present law, been sold at par.

The option to pay the entire bond off at any time should also be abolished.

The law should specifically exempt these bonds from taxation. They are a greater burden on the taxpayer than general bonds. They are a tax, and to tax them again is a tax on a tax.

Everything that can be done to make these securities desirable should be done in the interest of the taxpayer. The more desirable these bonds are, and the greater market there is for them, the lower the taxes for public improvements are. These bonds are in the nature of a statutory mortgage on real estate, and hence should be available as reserves required by law for insurance and surety companies.

A NEW JERSEY GOOD ROAD.

EDITORIAL COMMENT

Methods of Garbage Disposal.

The Proposed Government Cement Plant.

Incompetence in Building Construction.

METHODS OF GARBAGE DISPOSAL.

The appearance in this and other numbers of Municipal Engineering of articles upon various methods of garbage disposal suggests a few words upon the advisability of a thorough study of all the methods in determining what method shall be used for a given place. In this country, at least, the disposal of garbage has not been considered as an engineering question, with the exception of a very few cases.

In a few instances the matter has been turned over to the health authorities with some success, but the tendency of that department is to consider the sanitary features to the exclusion of all others, so that it is possible to pass by meritorious processes from the sanitary point of view because they have other components which complicate the view of them.

In the great majority of cases, however, the matter is in the hands of a council committee or board, whose members do not claim to be expert either in sanitation or engineering, and who are only anxious to get through with a disagreeable matter as promptly and as cheaply as possible.

The consequence is that the ordinary garbage disposal plant is more or less of a failure. The process costs too much, the plant is too small, the delivery of garbage to it produces nuisance, the process is odorous, the product is valueless, the plant is not durable, it is not well located. The list of troubles can be indefinitely extended.

It is not to be expected that the ordinary city official shall be an expert in such matters as this. The fact is, there are very few experts upon the subject in the country. The technical nature of the problem is coming to recognition, however, and the number of engineers capable of dealing successfully with it is slowly increasing. This article wishes to emphasize the need for the services of such a man in selecting for a town or city the best type of plant for garbage disposal.

From time to time this magazine will present articles upon the various methods of garbage disposal and the apparatus therefor, such as those above referred to, that our readers may have a record on their desks for reference of the latest and best upon this important subject.

THE PROPOSED GOVERNMENT CEMENT PLANT.

The engineers who estimated the cost of the great Tonto basin dam for irrigation purposes near Globe, Arizona, added to the local price of cement at Globe the cost of hauling it by wagon to the site of the dam, and thus made the cost of the cement $9 a barrel on the work. Mr. E. Duryee, an expert cement manufacturer, now an engineer on the reclamation service, estimated the cost of a cement plant at the dam, where suitable materials for making cement are found. He estimated the cost of making cement in this plant at $2 a barrel, under the difficulties regarding fuel at that locality. The cost of making the 150,000 barrels or so of cement needed in the dam, including the total cost of the plant considered as scrap at the close of the work, would approximate $3 a barrel. This shows an apparent saving over the engineer's estimate of $6 a barrel, or, say $900,000. It was therefore decided that a cement plant should be erected for the purpose of making the cement needed in the dam, and the machinery has been purchased for the mill.

The cement companies, upon learning these facts, protested against the action of the government on two principal grounds, one that the government should not go into competition with private corporations in the manufacture of any needed commodity, and the other, that the estimated cost of delivering cement at the work was much too high, and that the cement manufacturers had not been given an opportunity to show what they could do in reducing the price upon such large qualities of cement as are involved.

The first objection is an economic one which it is not the purpose to discuss at this time. It is one on which there are many opinions and which may easily be carried too far. As stated below, it

may not be necessary to consider it farther in this connection.

The second objection seems to have been well taken and was met by a call for bids from cement manufacturers, by which it developed that cement could be delivered at the dam at a cost of $4.81 a barrel, or $4.52 if the government did not retain the usual 20 per cent of the price until the completion and acceptance of the whole of the material. This reduces the estimated saving to about $1.80 a barrel, but this sum, amounting to $270,000 is well worth looking after.

Bids were received from very few companies. There are, in fact, very few companies near enough to compete, the two in Colorado and Southern California being the nearest and two others in the vicinity of San Francisco being the only other probable competitors.

Much capital has been made in some quarters of a claim that there is a cement trust which fixes the prices. The fact is, however, that there has been a cut-throat competition in the business, which has not been overcome, though it has been mitigated by recent conferences among the larger manufacturers. The companies have been put to it to do their best in reducing the price at the works and and in securing the best possible freight rates, so that the government's course has undoubtedly reduced the bid price a dollar or two below what it would have been had bids been called for in the beginning. From this point of view the purchase of the machinery has been fully justified even should it never be used.

The cement manufacturers propose a solution of the problem which seems on its face to be very satisfactory. Bids are to be received from the manufacturers to furnish cement on the work either from their own plants or from the government plant on the ground. The government may still hold itself in readiness to operate the plant if satisfactory bids are not obtained. The lowest bidder, if accepted, can then use the government plant with electric power from the government water power.

These bids will check Mr. Duryee's estimate of the cost of making cement, will increase the competition by extending the number of manufacturers who can reach the work, and, apparently, will give the government all the advantages of the ownership of the cement plant without the risk of depending upon the accuracy of the engineer's estimates of the cost of operating it. His estimate is more than double the usual cost of making cement by the dry process.

An important fact is emphasized by this discussion of prices, namely, the effect of freight rates in restricting competition and in fixing the price of cement. This is an exaggerated case, both because the long railroad haul and the wagon haul add a large amount to the factory price of the cement, and because the isolated condition of the work reduces the possibility of competition to a very small number of plants, say two, or at most, four.

The same factors enter into the fixing of rates in any case, but their effect is usually very successfully concealed. Under ordinary conditions of healthy competition, where plants are prosperous and do not need to cut below profitable factory prices, these factors operate first to restrict the competition to those factories where the cost of manufacture plus the freight charges are very nearly equal. Thus at A, cement from B, costing $1 to make and twenty cents for freight, will meet on equal ground cement from C, costing eighty cents to make and forty cents for freight. Any plant coming within this $1.20 limit has an equal chance.

The actual price of cement at A will depend upon many other items. If the demand is greater than the supply from these mills, the price will go up until a figure is reached at which plants with a higher cost but a smaller local demand can ship in their product. Thus the prices will fluctuate with the supply and demand in a healthy way.

If A happens to be so situated that two or three plants have a considerable advantage over any others, it is easy to arrange a combination which will raise the price nearly to that at which others can ship in profitably. If twenty or thirty is read for two or three and the combination extends to the restriction of production, we are as near a cement trust as we have ever attained in the American cement trade.

This illustration suggests one of the uses which may be made of the table of freight rates in the Directory of American Cement Industries. It could readily be carried much further if space permitted.

INCOMPETENCE IN BUILDING CONSTRUCTION.

A correspondent sends a list of failures of concrete construction in buildings which he says are used as examples of the inadequacy of this material for use in floors and walls and as fire-resisting protection for the supporting framework of

steel skeleton buildings. Most of these cases of failure have been fully described in the public press, many of them in technical journals, and in every case which has been fully investigated it has been shown that there has been some incompetence or dishonesty in the design or construction, more than sufficient to account for the failure. In one instance, concrete beams were built which depended upon ordinary brick walls as anchors, and when the beams were loaded with but a part of the weight intended for them, their deflection, on account of insufficient area of cross-section and error in its design, pulled the walls of the building down. In other cases the thrust of the cement arches spread the beams or the walls sufficiently to permit the concrete to fall through. In other cases the proportions of materials, methods of mixture or methods of putting in place were so defective that the concrete developed only a small fraction of the strength which it might have if properly made. Partial loading or merely the removal of the centering caused collapse in these cases.

The Darlington building in New York is the most recent instance of the collapse of a steel frame for a building. The exact cause for this failure has not yet been determined definitely, but it is undoubtedly due either to defective design, overloading of the frame with structural materials on the way to their places, or defects in the construction. The sufficiency of the design is presumed to have been assured by the approval of the plans by the city's building inspector, so that, until the report of the official investigation is made, the building contractor will bear the greater part of the blame.

Whatever the cause, it is due to incompetency or dishonesty of some sort. The city's department is presumed to have done its duty when it guarantees the sufficiency of the plans, but in view of the serious calamities caused by the collapse of buildings during or immediately after construction, it seems to be the part of wisdom to extend the authority of the department over the supervision of the actual work of construction.

Some of the friends of concrete construction fear that the attacks made upon the failures in such construction will weaken the public confidence in the material for buildings. It may possibly delay the recognition of its value in some instances, but rabid attacks are always very largely their own refutation and the rapidly increasing number of excellent constructions in concrete will soon extend the knowledge of its successes and the reasons for its failures so that the latter will be less frequent and the former will be more numerous.

The failure of the Darlington building should not destroy the public confidence in the steel frame methods of construction. Neither should the occasional collapse of a badly designed or constructed concrete floor or brick wall condemn concrete or brick as building materials. The effect will rather be to enforce closer inspection of the processes of construction as well as of the designs upon which they are based.

Concrete, especially cinder concrete, offered an additional proof of its value as a building material by successfully withstanding the great heat of the Baltimore fire. In the words of one engineer on the ground, "Concrete appears to have stood the fire better than anything else."

THE QUESTION DEPARTMENT

COST OF MAKING SLAG CEMENT.

Can you give me an idea of about the cost of a slag-cement plant of say 200 barrels per day, the class or makes of machinery required? We would like something like the Illinois Steel Company's north works plant on a smaller scale. Can you also give me data as to cost of producing slag cement in the barrel? D. D. G, Chicago.

If the slag is granulated at the blast furnace, where only it can be done properly, the only machinery necessary is that for drying the lime and the slag sand, a preliminary grinding of the latter, grinding the lime and slag sand together, elevators and conveyors, and packing machinery. The cost of this machinery will depend upon the kind of grinding machine selected. Griffin mills, made by the Bradley Pulverizer Company, tube mills such as those made by F. L. Smidth & Co. and the Bonnot Company, closed pebble mills or ball mills, and Kent mills are used in various plants, most of which make a preliminary reduction of the slag in one mill and the final grinding of the slag and lime in another. There are several dryers on the market. Reference may be made to the "Business Directory" under the headings "Dryers," "Cement Machinery," "Cement Plant Designers," "Tube Mills," etc., for names of manufacturers and dealers in cement machinery and experts in designing plants. They can give full information on cost when full details are known regarding materials and local conditions.

No definite figures are at hand regarding the actual cost of making slag cement. Estimates have been made varying from about forty cents up to sixty cents a barrel, the range showing the effect of local conditions and also the conservatism of the estimators.

MAKERS OF SAND AND CEMENT BRICK.

Can you give me the names and addresses of the different firms in the United States making sand and cement brick? W. J. M., Toronto, Ont.

The new edition of the "Directory of American Cement Industries" ($5), now nearly through the press, has a special list of the makers of stone and brick using cement and lime, in which will be found the names and addresses desired. Reference should also be made to the "Business Directory" elsewhere in this number under the heading "Cement Brick."

MAKERS OF ACETYLENE GAS MACHINES.

Will you please send us a list of the principal acetylene gas machine companies in the United States?
M. Marquette, Mich.

Hendricks's "Commercial Register" ($6) gives a list of about 150 makers and dealers in acetylene gas machines. Some of those in the vicinity of Michigan are the Abner Acetylene Gas Co., 36 LaSalle-st., Chicago, Ill.; Acetylene Apparatus Mfg. Co., 157 Michigan-ave., Chicago, Ill.; Alexander Furnace and Mfg. Co., Lansing, Mich.; American Acetylene Lighting Co., Battle Creek, Mich.; Briscoe Mfg. Co., 1427 Woodward-ave., Detroit.; Ransom Gas Machine Co., 372 E. Water-st., Milwaukee, Wis.

EFFECT OF FROST ON CEMENT POSTS.

We have commenced the manufacture of concrete fence posts at this place and and we would like to have your opinion as to whether frost would have any damaging effect where they enter the ground. We are making posts with five parts sand and gravel and one part Portland cement, mixed into a slush, and when the posts are about four days old we give them a dip into a solution of cement and water to close up the pores so as to make them non-absorptive. We have tried placing the posts in water and letting them freeze up solid and then have thawed them out, and to all appearance they were as good as they were before they were frozen.
GRIFFIN AND LOW,
Lake City, Iowa.

The amount of effect of frost upon concrete posts would depend upon the amount of water which could be absorbed by them. It is possible to make cement concrete which is practically waterproof, the proportion of cement to be used depending upon the amount of voids in the sand and gravel. This can be determined

for the sand and gravel used by measuring the amount of water necessary to fill a box already containing a known amount of the sand and gravel. In practice a little more cement is used to allow for defects in mixing the concrete. The proportions named are about the minimum for close-grained concrete. It is quite probable that experiment would show the advisability of using a little more cement.

Posts set in wet ground would need to be more impervious than those in well-drained soil.

If well done the process of dipping the post should aid somewhat in making its surface impervious, but it should not be depended upon as a complete correction for errors in mixing the concrete.

Concrete of the proportions named is less porous than many kinds of stone, and it would be less affected by frost than any but the densest and strongest stone. The tensile strength of concrete is greater than that of stone and the action of frost in bursting the post would have much greater resistance than it would have in a stone post similarly situated. Alternations in freezing and thawing posts porous enough to absorb an appreciable amount of water will result in a sort of granulation of the surface and the separation of these grains rather than in the spalling which often happens to stone under the same conditions. The life of a concrete post, well made except as to porosity, is therefore likely to be much longer than that of most stone under the same conditions. It is not difficult to reduce the porosity to a very small proportion with corresponding advantage. Whether the added life is sufficient to compensate for the greater cost will depend upon the amount of the excess of cost. The whole matter is a refinement which needs but little consideration in practice.

INFORMATION ABOUT CONCRETE BUILDING BLOCKS.

Does your monthly magazine tell all about concrete building block making and the machine? We will use the cheapest and best method of building concrete walls, cornices, floors, sills and steps for cottages we can get hold of; a plan that can be used without skilled labor. We can get sand, gravel, fuel and limestone on the land and common labor at $1 a day. Just now it looks as if we would use wooden molds in tongued and grooved sections and have a concrete mixing machine drop the stuff into the molds and form all the walls of a cottage at once.

M. G., Pittsburg, Pa.

Municipal Engineering may be said to give all there is about cement blocks and cement block machines. Since the development of this method of construction began, but little more than two years ago, this magazine has given everything of importance on the subject. The list of articles is too long to reproduce here, for nearly every number contains articles on the blocks and their use and the machines for making them.

CONTENTS OF A BAG OF CEMENT.

One local dealer will put out only three sacks of Lehigh cement to the barrel and other cements are delivered four sacks to the barrel, so I will be under obligations to you if you will kindly tell me how many sacks constitute one barrel of Lehigh cement.

J. W. BURNEY, Bainbridge, Ga.

The dealer referred to is apparently in error. The Lehigh Portland Cement Company conforms to the usual custom of putting 95 pounds net of cement in a sack, which is four sacks to a barrel. He is possibly confusing Portland with natural cement, the latter being delivered in paper sacks of about the same weight, but only three to the barrel, since natural cement weighs less than Portland.

SPECIFICATIONS FOR CONCRETE PIERS.

Will you please inform me where I can get specifications for concrete abutments and piers for railroad work. Or refer me to a book on railroading containing such specifications. A. W. FISHBAUGH,

Celina, O.

The "Hand-Book for Cement Users" ($3) gives the specifications desired.

CONCRETE BASE FOR FENCE.

We are about to construct a fence 600 feet long, the base of which will be made of concrete blocks 7 feet long by about 18 inches square, with the upper edges beveled.

Any information which you can give us regarding the best way to proceed to do this work will be appreciated.

M. & C., Philadelphia, Pa.

The laying of concrete blocks is a simple operation. The foundation being properly prepared (a very essential matter), the molds can be staked or braced in place, filled with the concrete mixture, usually made as dry as possible, and the tamping done. Before the concrete has fully set the forms may be removed and a smooth finish put on the sides and top and the bevel made in proper form. The instructions for laying curb given in the "Hand-Book for Cement Users" ($3) can be applied directly.

CRACKS IN CEMENT BLOCK WALL.

I have a building constructed of hollow cement blocks, placed on a frost-proof foundation. The wall is cracked half-way up the building and it was not caused by a blow or anything of that sort. The foundation did not crack or settle and the cracks referred to were in the blocks only. What was the reason?

D. Z., Hanover, Ont.

This can hardly be answered without an inspection of the building. As the question reads, the crack is due to some movement of the wall. Are the blocks cracked or does the crack in the wall follow the joints between the blocks? In either case settlement of the wall, expansion or contraction, or bulging of the wall by frost or some other force, which may be slight and soon disappear, might account for it. Further information is necessary to determine whether the fault is in the design or the construction of the wall.

PRICE OF CEMENT FOR SIDEWALK PURPOSES.

Please give me the prices on cement for sidewalk purposes. There will be some sidewalks put down here this year.

F. R., Fayette, Iowa.

Some recent bids run from $1.29 to $1.55 a barrel for cement in sacks on cars at the mill, to which freight must be added. The table of freight rates in the "Hand Book for Cement Users" ($3) and in the "Directory of American Cement Industries" ($5) give much help in determining the additional cost due to shipping charges.

CONCRETE WALK WITH NATURAL CEMENT IN BASE AND PORTLAND CEMENT IN TOP.

We note a very interesting discussion in your last issue regarding the adhesion of a natural cement base with a Portland cement top. We think your explanation is very good and covers the subject carefully. We, however, would like to add, as perhaps of some benefit to the party making the inquiry, that the specific gravity of a true Portland cement is at all times over 3, thereby being the heaviest hydraulic material known to the trade. It, therefore, forms a much denser mortar than any natural cement, which is comparatively light material.

In addition to this, all natural cements are but a high grade of lime, differing according to the foreign materials making up their composition, and they take their set or get hard in the same way that lime does; that is, they have to be exposed to the atmosphere and the water is evaporated.

Portland cement being an artificial mixture, the set is chemical; that is, when water is added to Portland cement a chemical change takes place. In theory, all of the water up to 20 per cent is crystalized and this will take place with or without air. Portland cement will set under water or in a vacuum and all of its characteristics are so entirely different from a natural cement that they cannot in anywise be classed together.

These facts, together with the difference in contraction and expansion, we believe will explain why a Portland cement and a natural cement should not be used together.

HOUSTON BROTHERS CO.
Pittsburg, Pa.

The writer does not agree with all the statements regarding the chemical action of natural cements stated above, but does agree with the proposition that the differences in the chemical actions are usually such that the two cements cannot be used safely in the combination under discussion.

TO WHICH STREET DOES THE INTERSECTION OF TWO STREETS BELONG?

Will you kindly inform me as to the solution of the following problem? Thirteenth street, running north and south, crosses South street (44 feet wide), which is paved east of the easternmost line of Thirteenth street. North of South street, Thirteenth street is 60 feet wide. South of South street it is 40 feet wide and its eastern line is opposite the western line of Thirteenth street north of South street, i. e., there is an offset in Thirteenth street equal to its width north of South street. An ordinance proposes to pave Thirteenth street from its north end "to the south line of South street." Is the part of this description in the intersection a part of Thirteenth street or is it a part of South street, and should any part of its cost be assessed on the block on the southeast corner of the intersection?

J. A. WILSON, Lexington, Mo.

This is a problem for attorneys versed in Missouri law to wrestle with. The council has evidently described this intersection as belonging to Thirteenth street. The end of the improvement abuts on 60 feet of the north side of the block on the southeast corner and in most States this would authorize an assessment upon this abutting property. The laws with the best detail provide for the assessment of the intersections upon the adjoining blocks of both streets. It is not necessary, in such case, to determine to which street the intersection belongs, for it will probably be paved with the first adjoining street paved and assessed upon the blocks each way, and when the other street is paved all parties will have had uniform treatment. As a matter of fact, most per-

sons would probably agree that the intersections in this particular case belong to South street, but in law the definition of the ordinance or custom may govern. The most equitable form of assessment should be chosen by the engineer and the modifications necessary to make this conform with the statutes may be left to the legal advisers of the city.

INSPECTION OF BRICK PAVING.

A correspondent states that he proposed the method of inspection of a completed brick pavement outlined in Municipal Engineering, vol. xxv, p. 425, and was met with the objection from the contractor that no engineer has done this; that it is unheard of, unfair, etc. On the other hand the taxpayers observe that the pavement has a very uneven, undulating surface and will not be satisfied until the work is fully inspected and made right.

In too many instances pavements are laid, especially in the smaller cities, without inspection by any competent city authority, or with so little, owing to the multiplicity of the city engineer's duties, that it practically amounts to nothing. The nature of the contract will govern the force of the inspection, but well-made contracts usually contain a provision that the discovery of defects at any time will lead to reconstruction of the defective sections, even though passed by an inspector. This is a salutary provision which is no hardship on an honest contractor, for the courts will protect him against any injustice which may be forced upon him, but will uphold the authorities in demanding reconstruction of work passed by incompetent or dishonest inspectors.

In case there is no inspection during construction, it is difficult to see how the condition of a brick pavement can be determined without cutting into it. Even the areas which show up well on the surface may be defective underneath and in worse condition than the areas which show greater defects to the eye. Such an inspection by an unprejudiced person can have no terrors for the contractor who has complied substantially with the contract even had this method of inspection never been used before.

The writer's experience covers more than one case of this sort. In one instance the property-owners attempted to prevent the assessment on the ground that the pavement was not constructed according to contract, though the city engineer's inspectors had passed it. A subsequent inspection was made by making small cuts in the pavement in the manner described in the article referred to, the points for examination being selected by the taxpayers who had appointed themselves as inspectors. Fortunately for the contractor, these cuts showed his substantial compliance with the terms of the contract.

Undoubtedly our readers can cite similar instances from their own practice and we will publish the results if they are sent in, with or without reference to names and places as may be preferred.

SLAG PAVING BLOCKS.

Will you kindly advise me whether paving blocks are being made from blast furnace slag in this country at the present time and, further, whether blocks of this character make entirely satisfactory pavements?

R. L. H., Philadelphia, Pa.

Slag is used for paving purposes and is furnished by the Vulcanite Paving Co. of Philadelphia, Pa. So far as the writer knows there is no use of slag paving blocks in this country on a commercial scale. Can our readers give any information on the subject?

LAYING LARGE WATER MAINS.

Norfolk is about to install a 30-inch water main, five miles long, to supersede one of smaller bore. The council resolution providing for the main restricts the bidding upon it to local contractors and plumbers.

This restriction has aroused much criticism. It is objected that no local contractor is equipped with the machinery necessary for handling such large pipe; that none has had any experience in caulking pipe of this size, and that unless the city, therefore, modifies its resolution, it is likely to pay two profits for the work.

It is said on the other side that local contractors can easily buy what apparatus they need for the work, and some declare that no special appliances are demanded for it.

Kindly tell us what special facilities, if any, are required for laying and caulking pipe of this size in the most effective way and under the cheapest and most favorable circumstances.

Tell us, also, if you can, what general custom is followed in letting contracts for such work by American cities in general.

MARSHALL BALLARD,
Norfolk, Va.

The restriction of bidding to local contractors is a question of policy which must be decided by the authorities calling for the bids. In case there are many contractors in the line of work for which bids are asked, there may be no disadvantages, but in case there are but few

such contractors there may be several. The smaller the number of possible bidders, the greater the possibility of a combination of bidders and an increase in price. If the work is somewhat unusual and but few, if any, have had any experience in it, this possibility is still further increased, for those who have not had experience may feel some hesitancy in taking risks with it and will increase their bids to cover the risk due to their lack of knowledge, or, as in some instances, when there are one or two bidders whose experience will enable them to bid low enough to insure the contract going to them, may bring about a combination which will put them on an equality.

Criticisms similar to this are easily made, and the bids, when received, may or may not show that they are well founded. Bids can almost always be rejected if too high.

In this particular case it may be said that the 30-inch pipe can be laid without any very special appliances. Heavier derricks will be necessary to handle it successfully, and there are special appliances for supplying lead and running it into the joints, as well as for caulking which materially aid in the work and consequently reduce its cost. These appliances can probably be rented if the work is not extensive enough to warrant their purchase and contractors desire to avail themselves of them.

A restriction of bidders to local contractors is not very common in the larger cities and if it is made on ordinary contracts it is likely to be omitted when competition would be too greatly restricted. Whether such a restriction is advisable in this case is a local question which cannot be answered without full knowledge of all facts.

BINDING FOR MUNICIPAL ENGINEERING.

What would be your price for binding Municipal Engineering?

CARL MAUGHMER,
City Engineer, Nampa, Idaho.

The Simplex binder can be obtained at this office of proper size for Municipal Engineering for 50 cents, each binder sufficient for one volume of six numbers. To the first order for binders should be added 30 cents for a stapler and a box of steel staples which are used in attaching the number to the back. Volumes will be bound for subscribers for $1.50 each, in half morocco, six numbers in a volume, the loose numbers being sent for the purpose. New bound volumes, including the six numbers and the binding, are sold for $2.50.

MAKERS OF SMALL TANKS.

Will you kindly give us the names of some of the manufacturers of small tanks made up in either copper or galvanized iron or both? The principal sizes will be such as are used by doctors, for instance, as supply tanks, with average pressure of 40 lbs. per square inch. Other sizes would range up to about 10 cubic feet capacity, with correspondingly higher pressures; for instance, tanks to be used in connection with gas engine starters.

F. W. S., Indianapolis.

William B. Scaife & Sons' Co., 221 First-ave., Pittsburg, Pa., can doubtless supply the tanks desired.

The Pressed Steel Tank Co., Milwaukee, Wis.; Ironclad Mfg. Co., New York City; Holthoff Machinery Co., Cudahy, Wis.; Randolph-Clowes Co., Waterbury, Conn., are other makers of copper or galvanized iron tanks and boilers who may be able to meet the requirements.

LIGHTEST GRADIENT FOR PIPE SEWER.

What, in your opinion, is the lightest gradient that should be used for an eight or nine inch vitrified pipe sewer, that is, in extreme cases.

SUBSCRIBER, ——, Mont.

Some discussion of this question will be found in Municipal Engineering, vol. xxii, p. 382. It requires a fall of one foot in 250 in an eight-inch pipe or of one foot in 300 in a nine-inch pipe to produce a velocity of two feet a second, running full or half-full, assumed to be a self-cleaning velocity, according to Kutter's formula. Latham's tables give one in 400 and one 450 as the gradients producing this velocity. If the sewer does not run half full the velocity will be less. If it is necessary to run the sewer on flatter grade or, as is ordinarily the case, it does not run half full, special means must be taken to keep the sewer clean. It is possible to run a sewer on a level line, but to keep it clean one must run water through it under pressure at intervals or must run cleaning tools through it. The gradients named are ordinarily given as the minima, but are not always possible, and when they are not, flush-tanks, flushing manholes, water pipe connections, or special appliances for cleaning must be supplied and used freely.

HOW TO LAY CEMENT WALKS AND FLOORS.

Mr. G. S. Neff of Rochester, N. Y., refers to the article in this department in the number of Municipal Engineering for December, 1903, vol. xxv, p. 419, on specifications for laying cement sidewalks, and makes some criticisms of it.

He objects to the digging of a trench 15 to 18 inches in depth to be filled with cinders or other porous material on the ground that this trench will fill with water which will freeze and throw the walk out of shape. This would be true were the trench dug in an impervious soil and proper provision for drainage were not made. The porous cinder, gravel or broken stone foundation is intended to remove any accumulations of water as far from the walk as possible and to leave the moisture in this foundation as much room to expand in freezing as possible so that it will not lift the walk. Were it possible to make a foundation which would at all times be impervious to water, it would be ideal. The soil cannot expand from freezing if there is no water to crystallize. But since few, if any, contractors have ever been able to obtain such a continuously impervious foundation, the next best thing is to have one so porous and so deep and so well drained that there shall be no accumulations of water enough to fill it full and with so much vacant space well distributed through it that any moisture clinging to the solid particles may have ample space in which to expand in freezing without crowding these particles out of place. Mr. Neff says:

Now, why not lay your walk on the earth as you find it and see to it that the water along your walk can drain off and also cut your flags well through at the joints so that they can give when the flags begin to heave and you will have less broken flags and also less settlement when the frost gets out of the ground. The article also gives the quantity of cement, sand, gravel and stone; viz., 1 to 3 to 5, making one part of cement to eight parts of sand and stone, which will make 45 square feet of finished walk. Now, at 1 to 8 cement and broken stone will make at least 60 square feet of walk; 1 to 5 will make 50 square feet of walk with 3 inches of 1 to 5 and one inch of 1 to 2 top.

Mr. Neff loses sight of the fact that 1 cement, 3 sand and 5 gravel and stone does not make a mixture equal to 8 parts. The sand will not much more than fill the voids in the gravel, so that the mixture is only a little more than equal to 5 parts in volume, thus approaching Mr. Neff's figure for 1 to 5 mixture. He continues:

The article also gives formula for laying cellar and basement floor, in which it states that 1 part of cement to 5 parts of sand and 10 parts of gravel or broken stone gives good results. Whew! That may do to look at, but not to use. That's like giving a Clydesdale horse a cupful of oats for a meal. You may think it sufficient for the horse, but it is only a question of time when the horse will die from overfeeding. To sum it up, you cannot expect to do good work and durable unless you use enough cement, and that good cement.

Now my way of building a walk is as follows: I never use a shovel full of ashes, cinders or clinkers. If I have to fill and get earth I use sand. I place my stringers; make my concrete 5 to 1 and the top 2 to 1, the concrete just moist enough to ball well in the hand; fill the frame level full; then pound down one inch. When I wish to make or cut my joints I place a 2x4 cross piece, of which I have three. I make my flags five feet square. I place a cross piece at every five-foot mark on the outside of the stringer and fill up at least five or six, remove the 2x4 crosspieces and fill the joints with sifted concrete and ram down well. When I have the five or six squares and the joints filled in, I proceed to put on the top. If the weather is warm and the occasion demands it, I sprinkle water on the concrete before putting on the top. I strike it with a straight edge, then let it set for a few minutes or until the surface will bear floating, then finish with trowel and as I go along cut the joints through the sifted concrete, top and all, open up the cut with the jointer and finish with trowel.

This laying every other flag one day and then the spaces between the next is a back number. I never use paper. By cutting as above you will have just enough space for expansion and you will have no double joints, but you must pound the joints well.

I have given guarantees for six years and in no instance have I been called upon to make good.

I have made one flag 13 feet long, four feet wide, all in one piece, four inches thick; also two flags seven by eight feet, four inches thick. They have been laid eight years.

All that is necessary is to see that the water can run off, not under the walk. Then your flags will raise even and will settle down again when the frost leaves.

BOOKS ON CONCRETE WORK.

Will you kindly inform me what practical coure of study or books to get to help me to fit myself to be able to figure on and execute contracts such as solid concrete work in bridges, culverts, also embankments, fill, and general contract work? C. W., Fulton, N. Y.

With reference to concrete work in general an English book has the most practical instructions, Potter's "Con-

crete" ($3). It is one of the older books, but is excellent, and when it is brought down to date by additional study of the "Hand-Book for Cement Users" ($3) will be found a valuable guide. Many things about concrete can only be learned by experience.

A new book, Gillette's "Earthwork and Its Cost," is the most complete book on this subject. Experience may not bear out all its statements, but on the whole it is a good treatment of the subject.

INDEX TO MUNICIPAL ENGINEERING.

In response to the request for expressions of desire for a printed index to the back volumes of Municipal Engineering, made in the March number, a few additional subscriptions have been received. Are there others who will purchase the index if it is printed? If enough advance promises are made the index will be published.

WEATHERING OF CONCRETE BLOCKS.

For something more than a year we have been manufacturing stone from cement and sand. The bulding stone put out by us has so far proven satisfactory. We have foundations which are now standing the second winter and the stone is apparently better and harder than when put into the wall. We do not use cement enough to fill all the voids in the sand, and our stone readily absorbs water. We have taken our stone and placed it under a hydrant and let it stand constant dripping, and in winter, freezing and thawing, with no apparent effect upon it, and the stone so used absorbs water freely. We have in the face of pretty general disapproval of our product by stone masons, made very encouraging progress in its introduction. Still the stonemasons insist that in the course of two or three years the stone will very perceptibly show signs of disintegration and say they have read that is the course of stone of this nature, and some say they have seen it. So far we have never been able to get anyone to point out a specific instance. The writer has just recently completed a new house in which he used the regular stone from our plant in the foundation, and without any misgivings as to the outcome. Can you give us some information as to the experience of those who have used stone of the kind usually made in the plants scattered over the country? We have made stones of various proportions, and all the way from 3 per cent of sand to 1 per cent of cement to 30 per cent of sand to 1 per cent of cement, but the stone we place on the market is uniformly 8 to 1. The other stones were for experimental purposes. The 30 to 1 rubs off easily, but seems to stand the effect of freezing and thawing as well as any and shows remarkable strength.

P., ——, Kan.

Reference should be made to the answer in another place to the question about the freezing of cement posts. One finds many small stone spalls at the foot of walls made of some classes of stone, which are apparently separated from the stone faces by frost, chemical action or the action of heat and cold in expanding and contracting the outer surfaces. The same spalls are not found at the foot of a concrete wall, partly because the concrete is not in so pronounced layers as the stone and partly because it has a much greater tensile strength and its surface is not so easily broken by the action of frost or temperature changes. The poorer mixtures of concrete may ultimately act as the 30 to 1 mixture referred to, so that the outer surfaces will rub off, and in that case fine dust or sand will be found at the base of a wall left undisturbed for some time. The richer mixtures do not have this difficulty and any mixture which makes a hard, homogeneous, smooth surface, such as 8 to 1 and stronger mixtures can be made to have, will not show this action, if one may judge by comparison with similar but not identical samples of concrete construction. Mixtures even weaker than 8 to 1 are often entirely satisfactory from this point of view.

The records on this subject are very meager and our readers are invited to add to them. We will publish all that may be sent to us for that purpose.

ADDRESSES OF CEMENT COMPANIES.

Will you kindly send us the addresses of the following cement manufacturers: Dexter, Phoenix, Reading, Vulcanite.

F. P. R., Johnstown, Pa.

From the "Directory of American Cement Industries" ($5) these addresses can be ascertained with full information regarding the products of their works, the offices and agents, brands manufactured, etc. The addresses are as follows:

Dexter Portland Cement Co., Nazareth, Pa.; Samuel H. French & Co., sole agents, York-ave., Fourth and Callowhill-sts., Philadelphia, Pa.

Phoenix Cement Co., Nazareth, Pa.; William G. Hartranft Cement Co., Sole selling agents Philadelphia, Pa.

Reading Cement Co., Reading, Pa.
Vulcanite Portland Cement Co., offices Philadelphia, Pa.; works, Vulcanite (postoffice Phillipsburg), N. J.

WOOD FIBER MACHINE MAKERS.

I am in the market for a wood fiber and wood pulp machine and thought you could possibly inform me where to get the best one in the market.

W. B. T., PLASTERER.
Charleroi, Pa.

Hendricks's "Commercial Register" ($6) gives the following names of makers of fiber machinery: Joseph C. Todd, 203 Broadway, New York; J. W. Voglesong, Elyria, O.; Wood Fiber Machinery Co., Sandusky, O. Wood pulp grinders can be obtained of several manufactures, the nearest one to the inquirer being Pusey & Jones Co., Wilmington, Del. Wood pulp knives are sold by Coes, Loring & Co., Worcester, Mass.

ACETYLENE GAS REFUSE IN SEWER.

We have several persons in town using acetylene gas plants. These people wish to run the wash and slaked carbide into the sewer. Can you furnish any information as to whether same will settle or fill up the pipes. B. B. M., ——, Me.

Can our readers give any results of observation? The character of the refuse seems to be that of finely divided rather light materials and it would seem that it would give no more trouble than other fine material, such as fine sand or clay. Is there a tendency to harden in mass if left undisturbed?

MUNICIPAL MATTERS IN COURT

Higher Courts—Gardner Water Plant—Liability of Water Company for Fire Loss—Classification of Bids—Reasonable Rates—Northern Pacific Merger.

Abstracts of Decisions of the Higher Courts on Matters Relating to Municipa.ities.

Prepared by Russell T. Byers, LL. B., Indianapolis, Ind.

Assessments—Avoidance Because Debt Limit is Exceeded—The owner of property knowing of a street improvement and acting under the advice of an attorney, made no objection until the improvement had been assessed. He is not entitled to have such assessment set aside, the assessment being equitable and fair, on the ground that the company, a foreign corporation, doing the work had not complied with the laws of the State relating to foreign corporations or for the reason that the contract was void because the city had exceeded its debt limit. Beaser vs. Barber & Co., 98 N. W. Rep. (Wis.), 525.

Assessment of Part Owner as Sole Owner—One owning a fractional part of a parcel of land abutting upon an improved street is liable for his proportional share of the cost of such improvement, even though notice is served upon him as sole owner, and is not served upon the other owners. City of Louisiana vs. McAllister, 78 S. W. Rep (Mo.) 314.

Assessment — Confirmation — Collateral Attack—It is too late to urge the failure to make an itemized estimate of the cost of an improvement a part of the record as a defense to an application for judgment for delinquent assessments. This objection should have been urged to the confirmation of the assessment. The general rule is that no objection (save lack of jurisdiction and that must appear on the record itself), which could have been made to the confirmation of the assessment will be heard when suit is brought for the delinquent assessments. The fact that the contract as advertised contained the eight-hour and so-called alien labor clauses, since declared void, raises the presumption that these items entered into the contract. But this presumption may be rebutted. Gave vs. People ex rel. Hanberg. 69 N. E. Rep. (Ill.) 635.

Improvements — Abutting Owners — Where the expense of constructing improvements is met by abutting property owners, they are parties so interested as entitles them to insist that all proceedings should conform to law. Under the statutes, where the board of public works declares the sidewalk of a property owner living on a non-graded street defective, such property owner is entitled to ten days' notice before the city will be justified in letting a contract for the improvement.—City of Waukesha vs. Randles et al. 98 N. W. Rep. (Wis.) 237.

Improvements — Contracts — Validity—Though the specification of a contract for public improvements contains a so-called alien labor clause, since declared invalid, it is competent to show that this item was not made a part of the contract, thus increasing the cost of the improvement. Where the contract contained such an invalid clause, which was disregarded by all parties, the contract was not void in toto as against public policy.—Doyle et al. vs. People ex rel. Hanberg. 69 N. E. Rep. (Ill.) 639.

Improvements—Sufficiency of Notice—Meaning of Repairs—Under the statute providing for the publication of a proposed ordinance for a street improvement, the fifth consecutive day may fall on Sunday and be included in the computation of time. Held, certain improvements were not repairs under Sec. 5,681, which provides that the cost of all repairs shall be paid out of the general revenue fund.—Barber Asphalt Paving Co. v. Muchenberger et al., 78 S. W. Rep. (Mo.), 280.

Ordinance — Resolution — Certainty — Under the statutes the description provided for in the resolution of the Board of Public Improvements need not be so detailed as that provided for in the ordinance authorizing the improvement. Description held sufficient.—Gage vs. City of Chicago, 69 N. E. R. (Ill.), 588.

School Property Assessment. — The State constitution and code do not exempt lots donated by Congress, title to which is in Board of Education, from taxation for local improvements. Such an expenditure is for the benefit of schools. Such lots may not be sold to enforce collection of assessments, but this is no objection to the levying of the assessment, nor does the fact that said lots are occupied and unused exempt them from such taxation. City of Chicago vs. City of Chicago, 69 N. E. Rep. (Ill.), 580.

Sidewalks — Advertisement — Right of Lien.—Under proceedings provided for in the statutes a sidewalk was constructed in front of the real estate in question. The advertisement for bids referred for the specifications to a particular ordinance which did not provide for this particular improvement. Held, no lien attached. City of Louisiana vs. Shaffner, 78 S. W. Rep. (Mo.), 287.

Special Assessments — Equalization—A finding that the property is "specially benefited and shall be assessed for the full cost of construction of said sewers according to their foot frontage" is equivalent to finding that the benefits are equal and uniform and is not subject to collateral attack.John V. Connell et al. 98 N. W. Rep. (Neb.) 457.

Street Improvements—Remonstrance—Effect of Withdrawing Same—Under the law when a remonstrance, signed by a majority of the abutting property-owners, is filed, remonstrating against a given improvement, the jurisdiction of the council is ousted and it can not be reconfirmed by a portion of the remonstrants withdrawing their objections. City of Sedalia vs. Scott, 78 S. W. Rep. (Mo.), 276.

Water Rentals—Taxing Power—The statutes limit cities, with a population of less than 5,000, to a seven mill taxation for hydrant rentals. This is a limitation on the taxing power, and such cities will not be permitted to levy an additional tax to pay a judgment secured in an action to recover unpaid rentals in excess of such limit. State, ex rel. Young vs. Royse, Mayor et al. 98 N. W. Rep. (Neb.), 459.

Water Supply—Where a civil district having no authority to contract for water for fire protection enters into such a contract the district is not liable on the contract.—South Covington vs. Kenton Water Company, 78 S. W. Rep. (Ky.), 420.

Gardner, Mass., Must Pay for Water Plant.

The decision of the Supreme Court of Massachusetts in the appeal of the town of Gardner, Mass., against the decision of the special water commission, makes it obligatory for the town to pay the Gardner Water Company $274,000 and interest at 6 per cent. from July 1, 1902. The only point in the commission's decision to which objection was made was the award of $90,000 for water rights in Crystal lake. The town contended that the water rights in the lake could not be considered as an asset that should be paid for.

Water Company Not Liable for Fire Loss.

The Supreme Court of California has rendered a decision which involves the question of whether a water company is liable for the value of town property destroyed by fire, where at the time of the fire the supply of water was deficient. A fire occurred at Ukiah, and through a breakdown of the pumping plant of the Ukiah Water Company there was no water in the town hydrants at the time. The fire destroyed much property belonging to individuals, and also a portion of the city hall and a lot of fire apparatus belonging to the town. The town sued the water company for damages, and a jury gave a verdict in favor of the city for the value of the property destroyed by the fire. The Supreme Court holds that a water company under the laws of the State of California does not by its charter undertake to pay for property destroyed by fire, although it may be negligent in supplying water at the time, and that neither a municipality nor an individual whose property is destroyed by fire has any right of action against a water company for damages.

Classification of Bids for Pumps Upheld by Court.

Justice Fort of the New Jersey Supreme Court handed down a decision March 3 in the case of the Marine Engine & Machine Co. of New York against the city of East Orange. The Marine Engine & Machine Co. filed an application for a writ of certiorari, claiming that it was the lowest bidder for pumps and engines to be erected at White Oak Ridge for the new water supply of East Orange. It cited that the contract for the work was awarded to the Snow Company for $48,050, which was about $10,000 higher than its bid. The contract was awarded for two 4,000,000-gallon pumps and three large boilers. The company held that the bids were classified as A., B. and C., and that on advice of the city counsel, Philemon Woodruff, the Common Council rejected the bids in class A. and C. and accepted the lowest bid in class B., that of the Snow Company. It was claimed in the application that the pumps and boilers of the Marine Company were just as good as those of the Snow Company, being equal in quality and having as much capacity for work.

In answer the city claimed that the three classes were different, and it was alleged that more coal was consumed in class A. than in class B. Also, that the engines of class B. were more durable and ran slower than those of class C., thus lasting longer.

In his decision Justice Fort decided in favor of the city on the ground that it had awarded the bid to the lowest bidder in class B. and rejected all bids in classes A. and C., and that all formalities had been observed. On the authority of four cases in the Supreme Court, no fraud having been charged against the East Orange officials, the court stated that it would not interfere with the exercise of discretion vested by the law in the city officers.

The decision upholds the principle that bids can be obtained in classes and that a municipality is not compelled to award the contract to the lowest of all the bids, but only to the lowest in any one set, rejecting all others.

Reasonable Water Rates Must Be Adopted.

In compliance with a decision of the United States Supreme Court, Justice Morrow of San Francisco dismissed March 2, without prejudice, the bill of complaint in the suit of the San Joaquin and Kings River Canal and Irrigation Company against the county of Stanislaus, awarding costs to the defendants. The Supreme Court's decision was as follows:

That hereafter, in case the counties of Merced and Fresno shall fix rates in such a manner that, taken as a whole, the rates in the three counties of Stanislaus, Merced and Fresno would not insure an income of at least 6 per cent, the complainant would not be bound to accept such rates, and this court would not bind it in regard to the propriety of rates for the future.

The Northern Pacific Merger Decision.

Justice Harlan of the United States Supreme Court handed down a decision, March 14, in the merger of the Northern Pacific and the Great Northern Railroad Companies. The decision, which affirms the opinion of the Circuit Court for the district of Minnesota, is in favor of the government and the effect is to sustain the contention that the Sherman anti-trust law applies to railroad combinations of the character in question. The suit was instituted by the United States against the Northern Securities Company and the two railroad companies and their leading stockholders, for the purpose of

dissolving the merger of the two roads, which the United States claimed had been created by the creation of a holding company, the Securities Company. This consolidation was claimed to be in violation of the Sherman anti-trust law. It was claimed on the behalf of the government that this consolidation was in effect a pool, created to promote the interests, not of one system at the expense of the other, but of both at the expense of the public. The railroads claimed that the transfer of the stock of the two companies to the Securities Company was in the nature of a sale and perfectly legitimate. Justice Harlan said that in the merger of the two roads the stockholders disappeared and reappeared in the Securities Company, the two thus becoming practically consolidated in a holding company, the principal object being to prevent competition. He said:

"No scheme or device could certainly more effectively come within the prohibition of the anti-trust law, and it is within the meaning of the act a trust."

In reviewing the contentions of the Securities Company, Justice Harlan quoted the various opinions involving the trust question, saying that from them it is to be gathered that all contracts in restraint of trade, reasonable or unreasonable, are prohibited by the Sherman law, and that Congress has the power to establish such regulations as are laid down in that law. Congress had power to enact the statute. Replying in detail to the points made for the Securities Company, Justice Harlan adds that the contention that the law is an interference with the rights of the individual States by which the companies are incorporated was not well founded. In such cases, he said, the authority of Congress is supreme. He also declared it to be unnecessary to determine the right of owners of railroad stock to sell their property nor was it true that the right of the Securities Company to own and hold railroad stock is the only question involved. Such contentions are wide of the mark—mere men of straw. All that the government complains of is the existence of a corporation to repress commerce, and is not concerned with the other points.

Justice Harlan said that in this day there should be no doubt of the complete power of Congress to control interstate commerce, all appropriate means might be resorted to for that purpose. All the prior trust cases were in support of that contention. Whether free and unrestrained competition was wise, he said, was an economic question with which the court need not concern itself, the question was that of statutory law.

He asserted the power of Congress over interstate commerce to be as complete as the power of a state over domestic commerce.

Coming to the plea of the railroads that the anti-trust law should be declared unconstitutional, he said that the court could not see its way to that end. "If the Securities Company's contentions are sound why may not all the railroads of the United States enter into a combination and by the device of a holding corporation control rates throughout the country in defiance of Congress?"

Continuing he said that there had been nothing in the securities company's certificate of incorporation to indicate its purpose to be that of destroying commerce, and he therefore absolved the State of New Jersey from any charge of such knowledge in advance. It might be true that a Federal Court has no power to dissolve a corporation of a State, but this circumstance could not be an indication of powerlessness to enforce the law, than which no corporation is stronger. No device could suffice to prevent this enforcement of the national statutes.

The courts had in deed consistently held to the supremacy of the national laws in case of conflict between those laws and the laws of the States. So long as Congress confined itself to its prescribed functions, he said, there could be no danger. At any rate the error, if any, was with Congress and it was for Congress to supply the remedy, and not for the courts.

In his judgment the evidence fully sustains the material allegations of the bill and shows a violation of the act of Congress, in so far as it declares illegal every combination or conspiracy in restraint of commerce among the several States and with foreign nations, and forbids attempts to monopolize such commerce.

ELECTRIC LIGHT

Improvements in Electric Arc Street Lighting.*

By H. W. Hillman, Schenectady, N. Y.

During the past few years, the manufacturers of electric street lighting material, and the electric lighting companies in general, have devoted much thought and attention to this subject.

The object of this paper is to demonstrate how closely such companies have co-operated with this association, with a view of beautifying rather than disfiguring the streets, and keeping well abreast, if not ahead, of the procession, marching on toward further municipal improvements.

Fifth avenue, New York City, is one of the best lighted streets in the world. Either day or night, it is representative of the best practice which the advancement of the art permits. The New York Edison Company owns the poles and lamps; also furnishes current for lighting. The policy of this company has been to install ornamental poles, and the most modern arc lamps, throughout the entire city of New York.

FIG. 1—ORNAMENTAL POLE, BOSTON, MASS.

One form of pole has an illuminated sign is a part of the pole equipment. The practical value of this sign at night has been written about and talked about so much, that it is unnecessary for me to add anything further. Its design being tasty and attractive also during the day-

*From a paper read before the American Society of Municipal Improvements.

time, it represents a municipal improvement in connection with which the New York Edison Company deserves much credit.

Those acquainted with New York City will remember the "Isle of Safety." How easy it would have been to arrange the arc lighting system so as to thwart the artist's design of beauty. On the contrary, it is entirely a work of art, completed by the engineering skill of the New York Edison Company. Incidentally

FIG. 2—OLD STYLE HOOD AND CUT-OUT.

it was necessary to turn the lamp upside down and equip it with a new and latest design of mechanism; but the grand point of the entire scheme was when the artist and the engineer came together and, with one accord, effected that design, which will stand for all time as a monument in honor of municipal improvements.

Not desiring to dwell at length on New York City lighting, I do wish to call your attention to another illustrat ion of the determined desire on the part of the electrical industry to advance electric street illumination only as it harmonizes with the attractive and ornamental appearance of other street requirements. Where the lamps are installed on bridges a careful inspection will show some of the prettiest designs of ornamental poles, especially considered in connection with the trimmings on the bridge, and particularly designed as a part of the bridge. In this installation I claim the utmost degree of engineering skill in behalf of municipal improvements.

The city of Boston has been highly favored in respect to ornamental electric arc street lighting. Everywhere throughout the city and suburbs of Boston will be found the so-called "Boston Ornamental Poles." Upward of 7,000 electric arcs illuminate this city, each and every arc being suspended on an ornamental pole. The Boston Edison Illuminating Company has made itself world famous by the installation of the electric inclosed arc street lighting system. It was not an easy problem for them to change their several thousand arc lamps and install a system entirely different from that which had been so extensively adopted and approved during the previous years. Notwithstanding, their efforts met with grand success, and this association can well afford to follow me in my endeavors to present the many features of this inclosed arc system which represent municipal improvements of a high order. (See Fig. 1.)

There are 8,760 hours during the year. Allowing 3,700 hours for darkness, there remain approximately 5,000 hours of daylight, when arc lamps and poles are on exhibition before the citizens of our communities. Fig. 2 shows an old-style hood and cut-out. The new style ornamental

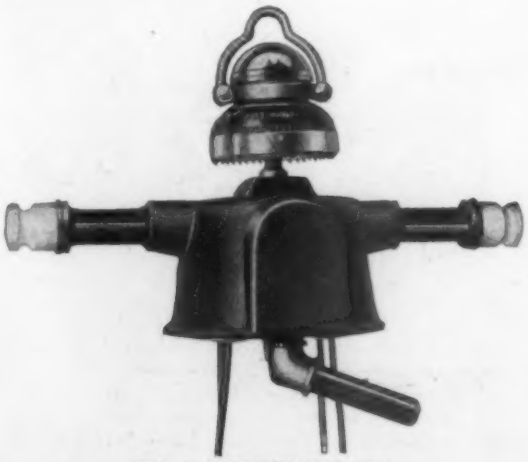


FIG. 3—MODERN CUT-OUT.

FIG. 4—ENCLOSED ARC LAMP WITH REFLECTOR.

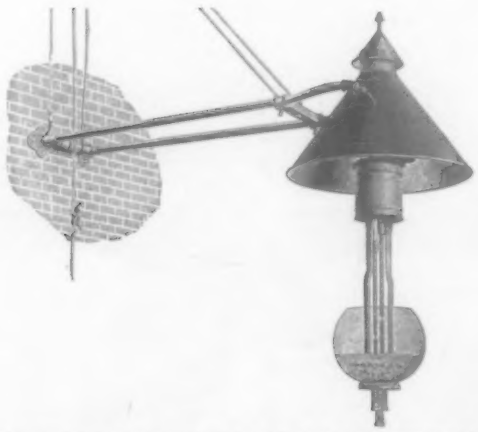


FIG. 5—OLD STYLE OPEN ARC LAMP WITH HOOD.

pole is equipped with a cut-out concealed within the pole, and the lamp is made weatherproof, so as to require no hood protection. When ornamental poles are not available. Fig. 3 illustrates a modern cut-out of ornamental design.

The new system includes a very attractive light reflector, its under surface being finished in white enamel. This will not rust or be subject to injury from the elements. It will therefore retain a white glossy appearance, with frequent attention from the attendant trimming the lamp. Its shape is symmetrical and in

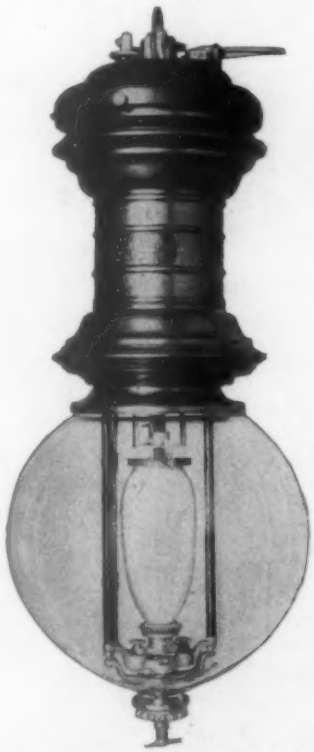


FIG. 6—ENCLOSED ARC LAMP.

harmony with the size of the lamp. (Fig. 4.)

The globes of the new system offer a marked improvement over the old style. Fig. 5 shows an exterior construction of the lamp, the globe being open at the top. Ample opportunity was afforded for the wind to blow the arc, and occasionally chunks of carbon would drop down into the globe. Dust and dirt accumulated there, which could not be easily brushed out. As a result, the globes easily became dirty and presented a bad appearance.

Fig. 6 illustrates a new enclosed lamp. Its inner globe prevents the carbon from dropping into the outer globe. The lamp casing rests snugly against the outer globe, and at all times insures a clean appearance.

Fig. 7 shows you an up-to-date washroom for cleaning globes. Each week the inner globes on the new lamps are changed and clean ones substituted.

Fig 8 shows one of the new carriages of the Buffalo General Electric Company, which is used for trimming the lamps, carrying carbons, inner and outer globes, etc.

It gives me much pleasure to illustrate this carriage, as it suggests a strong argument in favor of municipal improvements. In past years, the old style lamps required trimming each day, and it was not uncommon to see an old express wagon stop across the electric car tracks, holding up fifty or one hundred merchants on their way to business in the street cars, while the arc lamp was being lowered, trimmed and raised again into place. Municipal improvements are surely favored today, when a rubber-tired buggy of attractive design is driven to a lamp once a week and the lamp does not have to be raised and lowered in the street for trimming.

In a recent conversation with an electric lighting manager in the Pennsylvania territory, he stated that it was as much as a trimmer's position was worth to leave a broken globe on a lamp more than twenty-four hours. Surely such systematic efforts are co-operative with your own advanced ideas on municipal improvements.

Modern ideas regarding ornamental features have not injured the operating end of the arc lighting business.

On the contrary there never was a time in the history of arc lighting when the regulation was as good as it is today.

Fig. 9 shows a chart of the current variation on an enclosed arc street system, which is nearly a straight line without any variation. As a result, the 3,700 hours of darkness during the year are protected by a system so steady in operation as to have been commented upon by the most prominent electrical engineers of the country. The distribution of light has been improved, and the new system is the result of a new patented device known as the Street Luminometer. (See Fig. 10.) This instrument is considered to be a very valuable device. It is an easy and excellent method of proving to city authorities the comparative value of light distribution of the old and new systems.

FIG. 7—WASH ROOM FOR GLOBE CLEANING.

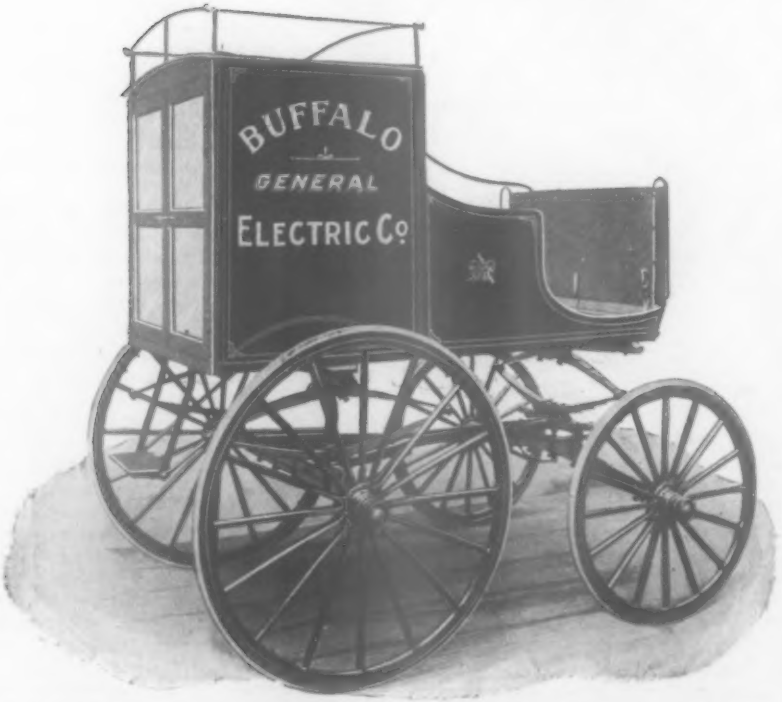


FIG. 8—TRIMMER'S CART OF THE BUFFALO GENERAL ELECTRIC COMPANY.

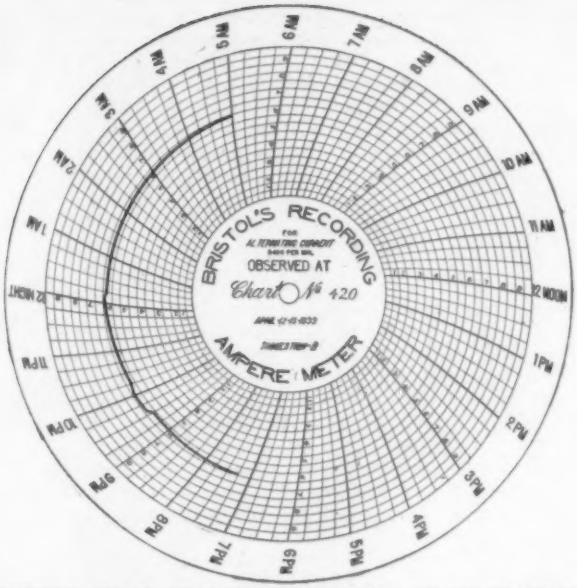


FIG. 9—RECORD CHART SHOWING REGULATION OF CONSTANT CURRENT TRANSFORMER.

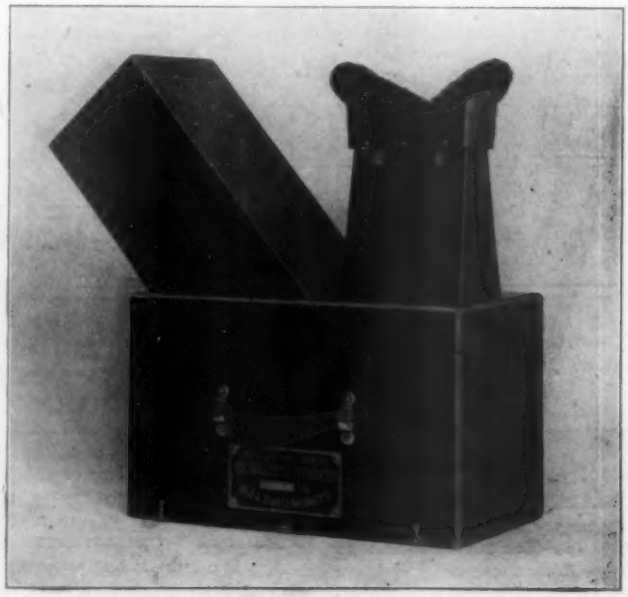


FIG. 10—LUMINOMETER.

The engineering improvements in hangers and cut-offs have minimized the danger of handling arc lighting circuits. This is a point which can be appreciated by everybody, regardless of the degree of technical education with which one may be favored.

Fig. 11 shows a style of ornamental poles used in Buffalo, N. Y.

After all, interruption of service is what the citizens wish to avoid. Some of the systems have decreased the number of interruptions and outages to such an extent as to amount to less than one-half of 1 per cent per night. This is a wonderful record, and could be attained only by reason of the improvements which have been effected in electric arc street lighting.

The members may well ask at this point to what extent have these improvements been carried out. In New England territory practically 70 per cent of the street lamps installed represent the enclosed arc system. In the New York territory, the figure is nearly as high. Through the entire United States the enclosed arc system is being installed at the rate of 50,000 arc lamps annually, and there are already installed upwards of 150,000 enclosed street arcs in all sizes of cities and towns in this country.

I do not hesitate to claim that the methods of the electrical companies for disseminating new ideas are second to none. To illustrate, the New York Edison Company issues a monthly bulletin to its customers. This bulletin reaches all classes. In connection with residence lighting, the families read the electrical news. In connection with the various classes of mercantile work, the proprietors of large and small stores alike, read this bulletin. It is one of the most widely published pamphlets issued, and, as if in honor of your association's meeting today, their last bulletin was particularly devoted to ornamental street lightin. I claim that the electrical industry has attained an enviable position when almost every man, woman and child in the residential district, and nearly every proprietor, clerk and boy in the commercial days, to erad the most advanced ideas in district, has an opportunity, every thirty connection with electrical improvements. If, in the future, such methods of disseminating new ideas in connection with the electrical industry shall continue, the cause of ornamental street lighting will be greatly advanced, and Municipal Improvement Associations will have reason to rejoice

Further, regarding the method of promulgating advanced ideas on municipal improvements in connection with electric street lighting, one of the largest manufacturers of arc lighting material in the world has issued, in the past few years, hundreds of thousands of pamphlets, profusely illustrated and recommending most modern arc lighting practice to the electric lighting companies throughout the country. This company will issue upwards of 50,000 of such pamphlets during the lighting season, which will be representative of hearty co-operation along the lines of municipal improvements.

ROADS AND PAVEMENTS

Street Pavements—Cost of Brick and Asphalt—New York Rapid Transit—Oil on New Jersey Road—Bids on Patented Pavements—State Aid in Ohio—Bitulithic Contracts in St. Louis.

Street Pavements.*

By Louis M. Pfeiffer, Denver, Col.

A street pavement is strictly speaking an engineering construction designed to carry certain loads and resist wear from blows and abrasion. The same materials are suitable for this as for any other form of construction, that is, stone, wood, iron and brick; and the only questions for consideration are: First, which particular one of these materials is best suited to the requirements, and, second, having decided upon the material, which is the best form in which to use it.

Iron is eliminated almost from the start. It has been tried in a few sections. It is unquestionably durable, but has been a failure from slipperiness and noisiness.

The hardest brick is very likely to be

*From a paper before the Colorado Polytechnical Association.

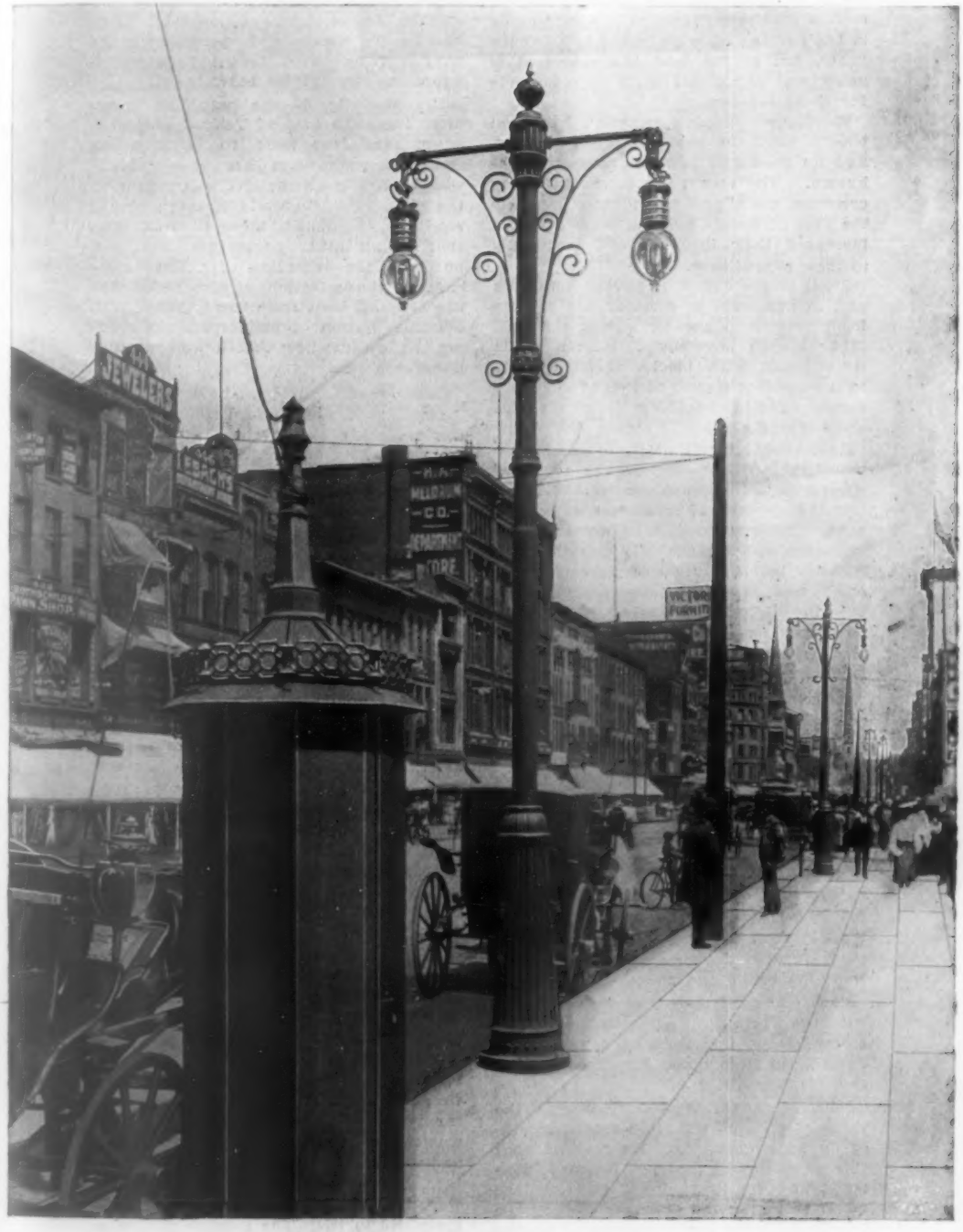


FIG. 11—ORNAMENTAL POLES IN BUFFALO, N. Y.

brittle and friable and the edges are liable to be broken by the blows of horses' feet. A great improvement has been made in the burning of brick in the last twenty years, but at the best the pavement is noisy and slippery and is objectionable for these reasons.

Wood, as a paving material, has been widely used for some thirty-five years, and its good and bad qualities are well-known. The recent processes of forcing creosote, rosin and other materials into the fiber of wood blocks have undoubtedly increased their life, but add materially to their slipperiness.

Stone is the oldest of paving materials and in one form or another has always been used to a greater extent than all other known pavements. Roman roads were paved with blocks of hard stone about one foot square and eight inches in depth. Broadway in New York was once similarly paved.

Round cobble was the next form of stone pavement. This possessed the merit of cheapness and afforded good foothold, but had the de-merit of roughness and noisiness. Baltimore today enjoys the pre-eminence of being the only city that has recently laid this form of pavement and she is now fast abandoning it. Philadelphia in 1883 had 530 miles of cobble stone pavements, while Brooklyn still has large areas of cobble, which, as in Philadelphia, is fast being replaced with other forms of pavement.

The next form of stone used was five-inch cubes of hard trap. This was first laid in Brussels, then imported to Paris and from there to America, where it has become widely known as the Belgian block. This block had the objection of having too many longitudinal joints which wore into ruts. The next step was to lengthen and narrow the blocks so as to decrease the number of longitudinal joints, which gives the present standard block pavement. Such pavements are the most durable known. The very best of them are rough and noisy.

In the form of macadam with or without the Telford foundation of large stones, stone has been used as a road covering in Europe and America for nearly a century.

John Macadam in 1816 discovered the value of wedging the large stones together by heavy pressure. He realized that this gave rigidity but not density. Water found its way down through the mass, softening the stone as well as the foundation. He also discovered that the rolling of small stone into the surface added density to the mass and increased the durability.

Telford in 1820 on discovering that the water soaked through John Macadam's surface and wet the foundation, often making it boggy and permitting the pavement to settle, invented what is known as the Telford base.

The students of the macadam pavement from the time of Telford and Macadam have done little to improve its condition. Macadam has been worked with by nearly all the civilized nations on the globe and thousands of miles of fine road are the result, more in area than that of all other pavements combined, but with the exception of a little more care in the selection of the stone, the use of much heavier rollers together with a better system of maintenance, macadam is the same now that it was seventy-five years ago.

Good road builders, however, have learned that the Telford foundation is not necessary to prevent the foundation from softening and settling. Large steam rollers are used to compact the ground and better drainage is offered to carry off most of the surface water, and it is very seldom today that we hear of a macadam road failing because of settlement.

The mines of asphalt rock in the Val de Travers, Canton of Neufchatel, Switzerland, were discovered in 1721, but it was not until 1849 that the utility of the material as a road covering was noticed. The rock was then being mined for the purpose of extracting the bitumen contained in it for use in medicines and the arts. It was observed that the pieces of rock which fell from the wagons were crushed by the wheels and, under the combined influences of the traffic and heat of the sun, a fair road surface was produced. A macadam road of asphalt rock was then made and gave fair results and finally in 1854 a portion of one of the boulevards in Paris was laid with pressed asphalt on a concrete foundation. From Paris its use extended to London in 1869, and it has been used to a considerable extent in Berlin. The success of the asphalt pavements in Europe led American inventors to seek to manufacture a material which should have similar qualities, and the first idea was to utilize the tar produced at gas works. The result was twelve or fifteen different compounds, and all essentially composed of sand and tar. Large quantities of this pavement were laid in Washington and other cities from 1870 to 1874. The greater portion of these pavements failed completely, and the impression has since often prevailed that coal tar or its products are entire-

ly unsuitable for roadway construction. The work was done at ridiculously low prices by contractors who had no previous familiarity with the construction of bituminous pavements or incentive to improve; in fact, at the time the pavements were laid no one in this country or Europe had any accurate knowledge of the requirements necessary to produce good work. A few of these pavements, however, are in use today, even on roadways, and have been in use much longer than any asphalt pavement in existence in this country or Europe.

All failures can be traced to the use of inferior grades of coal tar and improper methods of preparing the cement, and the use of improper sand in the wrong proportions.

The early failure of the coal tar composition pavements put them almost entirely out of use in roadway construction. A German chemist, Prof. DeSmedt, had secured a patent on a formula for making an asphalt surface, using natural asphalt as a cementing material. Experiments were made with Mexican, Cuban and Trinidad asphalt. The so-called Albertite, Gilsonite and other bitumens found in this country were also tried, but generally without success.

Samples of the Trinidad Lake asphalt pavements were laid in Newark about 1870 and New York City in 1873, respectively, but it was not until 1876 that a pavement was laid on a large scale.

In 1876 Pennsylvania-ave., in Washington, was in an almost impassable condition, being covered with rotten wooden pavement. Congress directed its repaving and appointed a commission consisting of Gen. H. G. Wright and Q. A. Gilmore of the corps of engineers, and Edward Clark, architect, to have supervision of the work. The terms of the law directed them to lay the best known pavements. They advertised for proposals, making no restrictions as to materials. They received forty-one proposals for every variety of stone, wood, macadam and bituminous pavements. Out of them all the commission selected two and laid these respectively on two-fifths and three-fifths of the avenue. These were the natural rock asphalt from Neufchatel and the Trinidad Lake asphalt mixture. Both pavements were completed in the spring of 1877. The Neufchatel pavement lived a life of about ten years, while the Trinidad Lake mixture is still in use after much repair and two complete new surfaces.

Prof. A. W. Dow, inspector of asphalts and cements for the District of Columbia, recently certified that a pavement composed of coal tar cement manufactured by E. B. Warren & Co. of Washington had been in successful use on Massachusetts-ave., Washington, for thirty years and the expense of maintenance has been less than one cent per sq. yd. a year during that whole time.

Referring again to the old pavements, Prof. Dow said: "In fact the long life of this and other old pavements can only be looked upon as a lucky accident and it is a remarkable illustration of what coal tar bitumen can be even under unfavorable circumstances. The many failures of the past indicate how they can be avoided in the future, and the valuable lessons learned from these failures, together with the scientific methods employed in the construction of the Warren pavements, insure uniform success for the future."

It seems to be a fact that the early asphalt pavements caused as much annoyance to the promoters as did the early coal tar pavements, but they were generally laid at a good margin of profit, under a guarantee system which justified and encouraged the most careful methods and immediate repairs to defects.

The business has developed from one of insignificant proportions to an industry carried on in about 100 cities in the United States. The merits and demerits of the pavement are well understood. When the asphalt pavement was first introduced it was considered to offer more advantages than any other pavement then in the field. Probably the most successful form of asphalt pavements has been that of the Trinidad variety, but this is partly because they have generally been laid with greater care and under scientific advice.

Asphalt is a name applied to a certain form of bitumen found in nature, and is generally a mixture of sand, dirt, clay, shells or limestone with natural bitumen. It is manufactured into cement by mixing it with other forms of bitumen, and this cement is in turn used to bind together particles of sand and fine or pulverized limestone as in the modern Trinidad asphalt pavements. No two asphalts are alike, and the life of the pavement depends somewhat upon the crude material, but more upon the skill in its manufacture into asphalt cement, and more still upon the proper proportioning and mixing of the cement with the sand and dust and in the selection of the mineral matter. It requires a large amount of experience to know how to combine the material. When the Trinidad asphalt pavement was first introduced no bitumen had

been known up to that time which was not waterproof and unaffected by water, and it was presumed that the Trinidad asphalt had these qualities. The greatest cause of failure in the Trinidad asphalt pavement is owing to the fact that the asphalt rots in water, and any minute sections of the thickness surrounding the sand particles in the asphalt pavement, will disintegrate in water. This weakness of the Trinidad asphalt was not thoroughly understood until very recent years, and the best road builders were at a loss to understand why the surfaces were so liable to disintegrate. Only when the mixture of sand used is so fine that water cannot penetrate the mixture, does the pavement show lasting qualities when subjected to moisture. At the introduction of the asphalt pavements, the proper rolling of foundations was not in vogue with any form of pavement, and engineers jumped to the conclusion that the hydraulic concrete foundation was essential.

The smooth surface of the hydraulic concrete has no union with the wearing surface of the asphalt pavement, and the tendency was for the surfaces to slide on the foundation, thus forming depressions or cups which would hold water, and this water standing on the asphalt had the effect of rotting or disintegrating and separating it from the sand, and a hole would soon follow. In an asphalt pavement composed of sand and asphalt it is impossible to use a sufficient amount of the asphalt cement to make a thoroughly water-tight roadway. This is because sand contains 27 to 45 per cent of voids or air spaces. Asphalt cement suitable for binding this sand togother must be flexible material, and if a sufficient quantity of the asphalt is mixed with the sand to thoroughly fill the air spaces, the surface is sure to shift and roll unless the asphalt is tempered so hard that it will surely crack and crumble in winter, which would be objectionable. As it is, the saturation of water into the surface of the asphalt pavement is the most common cause of deterioration, disintegration and ultimate failure.

When well built and kept in good condition the macadam pavement furnished one of the most pleasing roads, and if it could be kept in perfect condition would be the best form of pavement in use today, but the trouble is that it cannot be kept in good condition without very heavy expenses. The large particles of stone are partially bound together by finer particles of stone and stone dust. If the stone is very hard it is likely not to bind well; if the stone is soft, such as soft limestone, it binds better, but wears rapidly. If the roadway is kept moist, not wet and not dry, the natural paste or mortar holds the stone in place fairly well; if the surface is wet the binding material is converted to mud and washes away as is the case with excessive rains; if the surface is dry the binding material is converted into dust and blows away. This uneven surface induces more wear and more binding material is provided and the process continues, and the absence of binding material causes the stone to become dislodged and holes occur. The result is a roadway expensive to maintain; expensive to keep clean and one which is dusty or muddy a large part of the time and one which, but for improper binding material for the wearing surface, would be the ideal roadway.

In the bitulithic pavement a binding material for hard trap rock is used which does its work at all times and under all conditions and which will last as long as the stone, when properly held in place, will wear under traffic and thus the longest possible wear of the stone itself is secured. Ordinary sand has no firmness in itself, and such fine matter has from 27 to 45 per cent of voids. The firmness of an asphalt pavement must be secured by cementing together the particles of sand with the asphalt, forming an asphalt mortar. The sand and the asphalt cement are mixed in a heated condition and then spread on the street and rolled, and on cooling the asphalt mortar is set. The difference between asphalt which is too hard so that the pavement will crack and be brittle when cold in winter and one which is too soft so that the pavement will shift or roll in summer is very slight.

In the bitulithic process we are enabled to overcome the errors which occur in the pavements referred to.

First—By using only the best quality of coal tar and by properly refining the same, securing an absolutely uniform cement such as was not and could not be procured when the earlier coal tar pavements were laid, we have a cement which is much more adhesive to mineral matter and one which is absolutely unaffected by water.

Second—By using coarse stone, which in itself supplies the essential property of inherent stability to the wearing surface, which from its nature cannot be supplied by sand, we are enabled to use a softer cement, that is (a) one which has much greater life than could possibly be used with sand, and, (b) a cement with a much lower melting point which can

be used at a temperature where there is no tendency to destroy it by overheating during the process of mixing the wearing surface.

Third—We reduce the voids by separating crushed stone into six or more sizes and using exact proportions of the varying sizes, using as much of the coarsest size as would be used if none other were present and adding in the materials of receding sizes in such proportions as to fill the spaces between the coarsest sizes, and thereby accomplish a mineral mixture before the bituminous cement is added, which is 91 per cent solid stone, so that the voids do not exceed 9 per cent and the bituminous material used is sufficient to thoroughly fill all the voids and coat all the stone and thus the bitumen is not minutely subdivided and exposed to the weather as in the asphalt mixture. On account of the inherent stability of the mixture, its greater density and the greater softness of the cement, the cement itself has greater life than was possible in former mixtures. The durability of such a roadway depends upon the amount of actual abrasion of traffic, which the stone used in the mixture will sustain when properly held in place. The bituminous mortar used between the stones supplies a cushion which reduces the wear on the stone, makes it absolutely waterproof and protects the stone from softening influence of water. Among the greatest advantages of the pavement in addition to its great durability is that it is the least slippery of any pavement which has yet been constructed, and it is in successful use on 13 per cent grades.

The foundation for the pavement should always be thoroughly rolled with a heavy roller and after proper rolling has been accomplished, the bituminous concrete foundation used with the bituilthic pavement offers many advantages over the hydraulic concrete foundation used with the asphalt pavement. After the stone in the foundation is thoroughly rolled with heavy rollers, the bituminous cement is poured over the same for the purpose of binding it together. Into this foundation the wearing surface is rolled and is welded into it, and there is no danger of slipping or sliding of the surface as is an asphalt pavement. After the wearing surface has been compacted with a fifteen-ton three-wheel road roller, having several times as much compression to the running inch as the ordinary asphalt roller, the whole surface is thoroughly coated with bituminous cement for the purpose of closing up any honeycomb or surface voids which may appear between the coarse particles of stone, and into this cement is thoroughly rolled trap rock chips adhering to the cement and presenting a gritty surface to the wear of traffic.

Cost of Brick and Asphalt Pavements in Various Cities.

An investigation of the cost of brick paving in Chicago by the Chicago Inter-Ocean brings out the fact that the average cost is $3.50 a sq. yd. In order to make a comparison the city has written to 100 municipalities asking for figures, and has received a number of replies. These show that in the cities of Indiana the cost of vitrified brick paving varies from $1.25 to $1.45 a sq. yd. In Iowa the prices range from $1.30 in Keokuk to $1.50 in Dubuque. In Ohio, from sixty cents in Zanesville to $1.40 in Columbus. In Michigan, from $1.32 in Saginaw, famed for its brick pavements, to $1.60 in Grand Rapids. In Illinois, exclusive of Chicago, from $1.10 to $1.50. Brick paving in Evanston costs from $1.35 to $1.50. In Philadelphia it costs $1.40 and in St. Paul $1.90 a sq. yd. Richmond, Va., whose paving is done entirely at the city's expense, pays $2.20 a sq. yd.

The cost of asphalt paving in other cities is also being investigated. Columbus, O., pays the most, $2.75 a sq. yd., and Richmond, Va., is second at $2.70. Most of the cities pay from $1.75 to $2 a sq. yd., and about six cities pay as low as $1.53. Until very recently Chicago paid $3.50 to $4 a sq. yd. for asphalt paving, but the price has been reduced to $3 a sq. yd. This reduction is said to be the result of private parties inducing outside contractors to enter into competition in the city's work.

Progress on the New York Rapid Transit Tunnel.

The Rapid Transit Subway in New York City will, in all probability, be opened in June, the date not having been determined as yet. If it is found, however, that the subway cannot be completed—the situation depends entirely on labor complications—the opening will take place later in the summer. Up to date the tunnel has cost the city $31,089,900, with $2,312,000 for extra work. The contractor, John B. McDonald, is ultimately to receive $6,500,000 for the tunnel work proper. The extra work and the purchase of real estate for terminals and the acquirement of easements will make the city's tunnel bill about $40,000,000 by the time the road is fully running.

Oil on Road at Westfield, N. J.

An experiment is being made at Westfield, N. J., in the use of tar sprinkled over a macadamized roadbed to abolish dust and mud. An ordinary country road sixteen feet wide and in two sections of about 1,000 feet each, was selected for the experiment. On one the tar was run over the roadbed with the dust and screenings just as they lay. On the other the road was swept to the hard surface and then the tar applied. The result, in both instances, seemed to meet with the approval of the roadmaking experts present. The tar was applied in a very crude manner, being put on by hand from a big watering can. After being on the road only three hours it had penetrated nearly an inch, and in a short time after it was laid there was no tracking on it, and it did not spatter on wheels driven over it. The cost of treating a road in this way is estimated at $400 to $500 a mile for a road sixteen feet wide. This would require 3,000 gallons of tar to the mile. Owners of automobiles and the driving public are watching the experiment with considerable interest.

The scheme has been very successfully tried in France for some time and has given much satisfaction to automobilists.

Bill to Permit Bids on Patented Pavements in New York.

A bill was introduced in the New York Legislature March 16 providing that no patented pavement shall be laid in New York City unless the borough president or other officer having authority to contract to lay the same, shall in his notice to bidders ask for bids on some other form of pavement in addition to the patented pavement, and no contract shall be awarded for a patented pavement unless bids have been received for some other form of pavement. In the event the bid for the patented pavement shall not be the lowest bid, a contract shall not be awarded for said patented pavement unless the board of estimate and apportionment shall authorize the officer receiving the bid to accept it. The bill was introduced by Assemblyman Bostwick at the suggestion of the West End Association and of ex-Commissioner Willcox of New York City. The bill is said to be a blow at the asphalt monopoly. Under an old provision of the charter it was provided that no bids could be received for an asphalt pavement where patented articles were used in the material. Commissioner Willcox was advised to ignore the charter and advertise for bids for an asphalt pavement in which the specifications were not the same as the charter provided for. The Barber Asphalt Company objected and the matter was taken into the courts, where the contention of the company was upheld. The only way to get around the matter, therefore, was to have the charter repealed. Mr. Bostwick's bill permits bids to be received for pavements where the articles are patented.

State Aid for Road Building Proposed in Ohio.

A bill has been introduced in the Ohio Legislatufe providing that any roads, not in an incorporated municipality, the plans and estimates for which have been properly made by the County Surveyor on petition of the property-owners along the road and the township trustee, may be constructed by the County Commissioners. The plans are filed with the State Board of Public Works. When the work is completed, as certified by the Surveyor, the County Commissioners make requisition, endorsed by the State Board of Public Works, for 40 per cent of the cost upon the State Treasurer; 40 per cent is paid by the County Treasurer from the county road fund, on order of the County Commissioners, and 20 per cent is paid by the Township Trustees, which portion may be collected from the abutting property owners under procedure laid down.

The roads are divided into four classes, national highways, to be improved 15 to 24 feet wide; State roads, 12 to 20 feet wide; county pikes, 9 to 17 feet wide, and township roads, 6 to 10 feet wide.

The Township Trustees can be compelled to construct bits of road less than one mile in length required to connect State aid roads previously constructed.

Road machinery, supervisors, dissemination of information, precedence of roads in the same township, and annual appropriation of $220,000, not more than $2,500 to go to any one county in a year, repair of roads by Township Trustee under supervision of County Commissioners and State Board of Public Works, are provided for; also construction of electric lines.

No report of the possibility of the passage of the act by the Legislature has been received.

Bituminous Macadam Contracts in St. Louis Upheld by Supreme Court.

The decision of the Circuit Court in the case of William H. Swift against the City of St. Louis, involving the validity of contract for Warren's bitulithic pavement, will be found in brief in Municipal Engineering, vol. xxiv, p. 284.

The decision of the Supreme Court on appeal was indicated in vol. xxvi, p. 205. The full text of the decision has now been received and is of sufficient interest to warrant a rather full abstract.

The suit was one in equity against the city and the Board of Public Improvements to enjoin the said board from making a contract for the pavement of W. Pine-boulevard with "bituminous macadam" under city ordinance No. 20,822. This suit is based upon the alleged invalidity of said ordinance providing for said pavement

Section 27 forbids the assembly to directly contract for such work or improvements contemplated by the charter, or to fix the price or rate therefor, but in all cases, except in cases of emergency work or necessary repairs, the board shall prepare and submit to the assembly ordinances with an estimate of cost thereof endorsed thereon, authorizing the doing of any proposed work and under the direction of such ordinance shall advertise for bids in the papers doing the city printing three times, the last publication to be at least ten days before the day appointed for the opening of the bids, stating the general nature of the work to be done and time and place when the bids shall be recived, and shall let the contract to the lowest responsible bidder Any other mode of letting out or contracting for work shall be held illegal and void.

On June 3, 1902, the said board at a regular meeting selected "bituminous macadam" as the material for the reconstruction of said street, and recommended to the Municipal Assembly an ordinance therefor.

Among the specifications of material to be used for the reconstruction of the street it was required that the pavement should be of certain compositions prepared by one Warren, and known as "Warren's No. 1 Bituminous Semi-Liquid Composition," "Warren's Brand," and Warren's No. 24 Puritan Brand," and "Warren 's quick drying bituminous flush-coat composition."

The specifications are then briefly put forth. In the published notices no reference is made to the Warren mixture.

The petition alleges that the ordinance was void for the following specific reasons:

First—That it arbitrarily deprived the land owners of the benefit of competition, in that bituminous macadam was not an original composition, but a well-known composition of an original material made up of broken stone and any bituminous substance used as a cement or binder; that the Warren materials specified were not patented articles, and were nothing but certain grades of coal-tar branded with Warren's name, and that the specifications thereof precluded competition and designated Warren and his associates as the sole bidders, and that this arbitrary specification was in violation of the rule of competition prescribed by the charter.

Second—The ordinance did not specify all the materiel with which said bituminous macadam should be composed, nor did it fix the manner and general regulations under which it should be constructed, as required by the charter, but left the entire composition thereof, other than the arbitrary selection as aforesaid of the Warren mixtures, to the discretion of the Street Commissioner, and thus unlawfully delegated the power and authority of the Board to the Street Commissioner.

Third—That the public notice did not state or warn the property owners that the bituminous substance to be used as a cement should be those produced and controlled by Warren, designating the pavement simply as "bituminous macadam," which name did not imply or suggest the designation of any specific manufacturers' brand of binding material.

The petition also alleged that bituminous macadam was an untried experiment, and had never been demonstrated by efficient use for a series of years that such pavement would constitute an efficient wearing surface under city traffic. That the board had advertised for bids for a contract under the ordinance and would enter into a contract and issue special tax bills against plaintiff's property unless restrained by the court.

The answer admitted the ordinance and their proposed making of a contract thereunder as alleged and that said proceedings were in all things regular; that there was only one pure waterproof macadam which had been tried or tested and that this was a pavement composed of the Warren mixtures, that the specifications were as full and complete as the nature of the subject would admit.

1. It is conceded by the learned counsel for the plaintiff that this court in Asphalt Company vs. Hunt, 100 Mo., 22, held that the City of St. Louis, under its charter, was not prohibited from letting a contract for paving a street with materials covered by letters patent; that to hold otherwise would be to deprive the city of the right to enjoy the benefits of modern invention. When that question was again raised in Verdin vs. the City of St. Louis, 131 Mo., 26, the Hunt case was reaffirmed and the doctrine as to patented material was extended to a material whereof the owner had a monopoly by reason of his exclusive ownership of the natural supply of such material.

As was said in the latter of those two cases, so many contracts had been entered into on the faith of the decision of this court in the Hunt case, that it had

practically become a rule of property and that it was too late to disturb that ruling. But it is insisted that those cases went too far, and while the court might not disturb them on the principle of stare decisis they ought not to be extended because to do so would strike down the last protection of the abutting property owners against discrimination and favoritism in contracts for public improvements which are made a charge in invitum against the private citizen. The insistence is that the facts of this case do not bring it within either the principle of a government patent nor yet within the Verdin case, a monopoly based upon the ownership of the only source of supply of a natural product, but it is a designation by the Board of Public Improvements and ratified in the ordinance by the Municipal Assembly, of certain brands of a certain manufacturer of a well-known mercantile article, preparations of coal tar, and in so doing the board and the Municipal Assembly deprived the tax-payers of all the benefit of competition which the charter secured to them in the letting of public work.

On the other hand the city maintains that its Board of Public Improvements and its Municipal Assembly are vested with the power to determine the character of street improvements and the courts will not undertake to interfere with the discretionary powers of its officers within legal bounds; that when a city in the prosecution of a public work finds an article or material which in its judgment is best adapted to such work it is not debarred from availing itself of it because such material is controlled by one party. The Circuit Court dismissed the bill and held that the city authorities were authorized to specify Warren's brands of coal tar cement as the binding material in the construction of a bituminous macadam pavement.

After a careful reading of this record we gather that for many years pavements have been made of coal tar and coal tar productions, but the difficulty encountered was the inability of the tar preparations, and we think the burden of the proof was that coal tar cement properly made is a most excellent binding for macadam; that it resists water when properly made. A notable case is of a pavement laid in Washington City thirty years ago and which is still in excellent condition, but it had been discontinued by contractors because of their inability to get a uniform quality sufficient for any considerable amount of work. But the evidence tends to prove that the Warren Brothers of Cambridge, Mass., by continued effort have succeeded in making a uniform coal tar cement; that, while other dealers in coal tar productions might produce a cement of uniform quality, as a matter of fact they have never done so, and at the time W. Pine Boulevard was to be reconstructed there was no other company or individual except Warren Brothers making a satisfactory coal tar cement.

There was, then, this condition confronting the Board of Public Improvements and Municipal Assembly when they came to decide what material they should adopt for the reconstruction of W. Pine-boulevard. The bituminous macadam had the advantage over asphalt pavement in that horses were not liable to slip and fall on it, especially in cold weather. It was sufficiently strong owing to the rock in its composition to carry great weight and the coal tar cement was impervious to water and would make an enduring pavement. A large number of other cities were using it to advantage. They were desirous of testing it, but they were advised that the only proper binding for the macadam known up to that time was the Warren's cement, and accordingly they required that cement in the specifications submitted.

The main contention of plaintiff is that by so specifying Warren's brand they have prevented competition and thus violated the charter. This question is by no means a new one. While the learned counsel for plaintiff urges that coal tar is a common article of merchandise and that the specifications should not have been limited to Warren's brands of coal tar cement, we think the proofs demonstrate that up to this time there was only one such cement so made as to be equal and uniform. How, then, can it be said that in adopting the only proper cement known for the binding in a bituminous macadam pavement the board exceeded its authority any more than it would have done if it had adopted an asphalt pavement and specified Trinidad Lake asphalt as the material?

This court approved the Trinidad Lake asphalt specification in the Verdin case because the monopoly therein resulted from the ownership of the whole natural supply of that article. Can it make any material difference that that supply in this case is the result of a long and persistent effort to produce a uniform cement? In each case the owner has the only material which the city desires to use. Having held, as this court has in the Hunt case, 100 Mo., 22, and in the Verdin case, 131 Mo., 22, that the city is not precluded from using the best material because it is a patented article or a monopoly which denied competition, how can it be consistently ruled that it cannot use a desirable article because only one firm manufactures it? It is not answered by saying other persons might produce it. They have not done so and a public improvement is not to be delayed to await the pleasure of other persons to experiment and see whether they can produce the proper materials. But it is insisted that the board and Municipal Assembly might have accomplished the same result by selecting a cement of the standard of the Warren Company. In other words, knowing there was no other proper and uniform coal tar cement made except that of the Warren Brothers, they could have fixed theirs as the standard. Would it not at once be said, and prop-

erly so, too, that they might as well have specified Warren's brands directly as to have done so by indirection?

In the case of Schoenberg, vs. Field 95 Mo. A 241, it was properly ruled that when the Board of Public Improvements arbitrarily selected vitrified brick of a certain make, when the Board's own records disclosed that other manufacturers made brick of the approved standard, it was a denial of competition and void. In this case we find from the evidence that there was but one known manufacturer of coal tar cement of equal uniform quality and that was made by Warren Brothers. Had the evidence disclosed that other manufacturers made a coal tar cement suitable for binding the rock in the macadam, we think it would have been the duty of the Board to select a standard of such cement and require bidders to conform to that standard and provided proper tests, but where, as in this case, the whole supply is owned by one individual and it is the only suitable article for the public improvement, we see no reason for denying the city the right to avail itself of it if we are to adhere to our former decisions permitting the city to use patented articles and materials in which one party has a monopoly by the ownership of the material supply.

II. As to the objection that the specifications did not call for coal tar cement in so many words, but named Warren's Puritan Brands, the evidence clearly indicates that all the contractors understood fully that these brands were coal tar cements.

III. The notice to the property owners to consider the improvement we think was a substantial compliance with the Charter, referring as it did to the specifications on file in the office of the board and street commissioner. Nor was the ordinance void because it left certain details to the discretion of the proper city officials. The evidence disclosed that such details amounted to an infinitesimal proportion of the work.

In consideration of the whole record we think the judgment should be and it is affirmed.

The fact that the bituminous madaccam pavement is patented was not mentioned in connection with this case and it is therefore not touched in the decision.

REFUSE AND SEWAGE DISPOSAL

Bacteria and the Septic Tank—Refuse Destruction in Burnley.

Bacteria and the Septic Tank.

In an interesting article on methods of sewage disposal for Baltimore, written for the Baltimore Sun, the following concerning the methods of operation and the operators in a septic tank appears:

The fourth method of sewage disposal is by means of the septic tank, in connection with small filtering beds composed of layers of sand, gravel and stone or coke. This is the latest development in sewage purification and perhaps the most efficient, if not the cheapest. The bacteria are given special facilities to do their work—to eat up the organic matter in the sewage and then eat each other. It is called the "natural method," since it frankly turns the whole work over to the natural agents, first of putrescence, then of ordinary innocuous decomposition.

In one cubic inch of sewage there have been found 17,000,000 bacteria that work without air (anaerobic), 5,000,000 of these having the power to liquefy solids. The same cubic inch had eighty-five more millions of bacteria that work or feed only where they can get air (aerobic), and of these about 8,000,000 could liquefy solids. Those which work without air produce putrefaction, resolving organic matter into carbonic oxide, marsh gas and sulphuretted hydrogen, inflammable and poisonous gases of ill odor. They do not reduce organic matter into its simplest forms, but into these objectionable compounds. The aerobic bacteria, on the other hand, carry the dissolution to its lowest terms and produce innocent products which have no smell.

One cubic inch of sewage such as is found in our cesspools contains sometimes as many as 510,000,000 of bacteria. These are of various species, the innocent bacterium coli commune (from the human body) being very abundant. Dis-

ease-producing bacteria are comparatively rare, being found only when a typhoid patient or other patient suffering from an infectious disease has recently contributed to the contents of the cesspool. It is a fact of capital importance that of the 440 known kinds of bacteria 190 kinds liquefy gelatine upon which they are placed and some of them do a useful work in liquefying the solid organic matter of sewage.

According to Bujivid, 800,000,000 bacteria would weigh one-sixty-sixth part of a grain and 289,000,000,000 one pound. They multiply with amazing rapidity by dividing, each half being as much father as son. If, as supposed, the division takes place as often as once every hour, then in twenty-four hours one bacterium will reckon his posterity at 16,500,000, and in one week he will require fifty-one figures to give their number. After five days his posterity would equal in volume the entire ocean. But bacteria are kept within limits by want of moist food and by their cannibalistic way of eating each other, to say nothing of enemies and the unfavorable conditions they find and make for themselves.

The bacteria which produce fever are said to be rather delicately constituted and fall a prey to others and the same is to be said, it is believed, of other disease-producing bacteria. But if the typhoid bacterium escapes from the cesspool into the soil, being carried along by the leaking sewage, he may survive weeks and months and have the luck to be carried by a particle of dust into the pantry. Or he may be carried from the cesspool on the proboscis or feet of a housefly to a milk pail or dish of fruit and thus find his way into the body of a susceptible person whose vitality has been lowered by breathing air contaminated with exhalations from the cesspool.

Bacteria operate both where inorganic matter is to be converted into organic matter and where organic matter is to be broken into its inorganic constituents. They "fix" nitrogen for example, taking it from the atmosphere and supplying it in a utilizable form to the roots of clover, peas, beans, etc. They take part in digestion in the human stomach, converting solids into liquids which can be assimilated. So small are bacteria that they are invisible to the unaided eye. A glass of water may contain a billion of them and yet it will be clear. A temperature less than that of boiling winter kills them, but cold—even 200 degrees below zero—only torpifies them. They swarm in the atmosphere, thousands to the cubic inch of air, and begin at once to grow and multiply as soon as they fall upon a moist organic substance at the right temperature.

Refuse Destruction in Burnley, England.

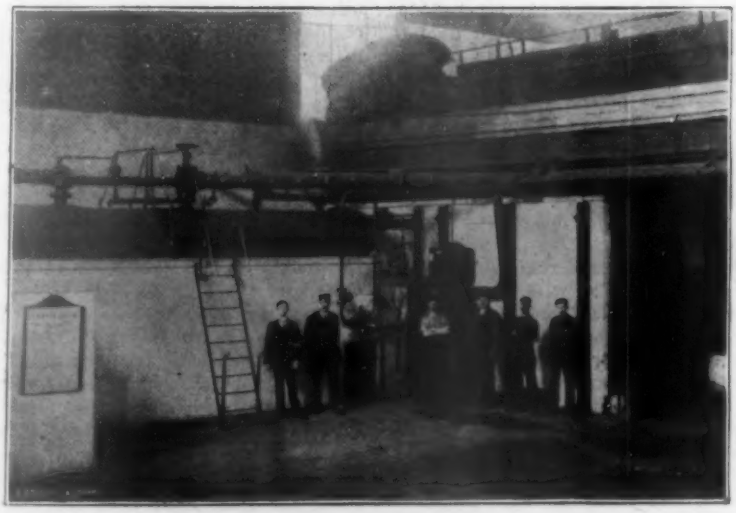
The installation of plants for the destruction of refuse has become quite frequent in English towns and cities. It is the fashion upon the successful inauguration of a plant to issue an illustrated souvenir describing the buildings and apparatus and showing the results of the operations.

One of the recent souvenirs of this sort is that of the Meldrum refuse destructor and power plant, installed at Burnley and first fully worked in April, 1903. The souvenir is dated January, 1904, and gives a report of the results of the works after they were put in full working order. The following description of the plant is taken partly from the souvenir and partly from a report of a visit to it.

The first destructor erected in the corporation was a "beehive" in January, 1884. It disposed of 1,000 to 1,400 tons a year at an average cost of 3 shillings 4 pence a ton. In 1894 another type of destructor was installed, but failing in its duty was discontinued for some years, again being put in use with radical modifications in the years 1898 to 1903, when the present plant began operations.

In the center of Burnley is the tallest chimney in the district, towering high above its fellows of the same base level. A few years ago, when the first destructor was at work, you might have seen a thin haze about the top, but what was more, the residents in the vicinity complained of small portions of unconsumed refuse being discharged from the top to fall into the streets, causing an undesirable smell. Now, however, the chimney appears idle. No sign of smoke is visible at the mouth, but nevertheless that is no criterion on which to base a calculation as to the work done at the public refuse destructor. In this case, at any rate, the absence of undesirable discharges from the chimney top indicates the more perfect combustion in the destroying cell below. Two hundred and fifty tons of refuse, which would otherwise have to decay and rot and emit its disagreeable and often harmful effluvia on some tip, is burnt every week to a fine dust or a useful clinker, and the only

Entrance to Destructor and Electric Plant.



Rear of Cells and Boiler.

REFUSE DESTRUCTOR AT BURNLEY, ENGLAND.

heat that escapes up the chimney is that unused because there is not further appliance in the shape of boiler accommodation. For fifteen hours out of twenty-four over a thousand degrees of heat—obtained from nothing else but town's refuse, not a "cob" of coal or stick of firewood being utilized—are generating continuously anything up to 400 horse-power, and which is sent on to the common steam fund of the electricity works for the purpose of running their engines and producing electrical power. At one time the whole of this heat went to waste up the chimney. Now, less than one-half of the heat escapes.

A lofty hall is entered, and at the further end are the neither regions, where dirt begrimed men are shoveling rubbish into the furnaces, or stirring up the refuse with long iron rakes or bars, a fierce and hot glow from the grates casting a weird picture indeed. To the right is the old destructor, now unused, and which was erected about five years ago. This was fed from the top, the refuse being shoveled down a shoot to the fire. On account of the matter falling on the top of the fire, and other reasons, the destructor was unsatisfactory. The idea was then carried out of feeding the same cell from two grates at the bottom, which brought about a better state of things the output being doubled, about two tons per hour being nicely got through. This however, was not sufficiently serviceable and to the left has been erected a Meldrum destructor, which seems to answer all that is required of it. The refuse when brought, is precipitated down huge hoppers, and the stokers below shovel the material into the fire grates which are immediately opposite, thus avoiding the rising heat from the fires, and consequent stewing of the refuse while waiting to be burnt.

The continuous grate taking the place of four isolated cells, with the ashpits so arranged, and the forced draught so applied, that practically three-fourths of the total grate is working at full capacity all the time, is an innovation of the highest importance in securing efficiency By this means the combustion chamber remains in an incandescent state (about 2,000 Fah.), a constant boiler pressure is maintained, and uniformly high evaporative results are assured. As all noxious vapors pass over the hottest part of the fire, the final and sanitary disposal of the refuse is effected, and no particles of unburnt paper, etc., can possibly find their way to the chimney.

The Regenerator fulfils a function analogous to that of the fuel economizer in an ordinary boiler plant, only that it heats the air for combustion instead of the water for the boiler. By this means a temperature of about 350 degrees is given to the air before it is forced into the fires. A great advantage is thereby secured, the furnace temperature being materially increased, and there is no difficulty in dealing with refuse containing a high percentage of moisture, and of low calorific value.

The gases of combustion pass from the furnace into the combustion and settling chambers, where most of the dust collects and is readily removed daily by means of convenient doors. Ample provision is also made for cleaning out the boiler flues, etc.

The clinker is taken to one side and allowed to cool, the larger pieces are sent to the filtration beds at the sewage works, and the smaller go to the tips and filling-up places.

The terrific heat that is generated by the high temperature system is not allowed to go to absolute waste. Situated behind the furnace is a large Lancashire boiler, 30 ft. by 8 ft., with two tubes. It is specially adapted for being treated from the combustion chamber. With coal fuel the boiler would be capable of producing 250 to 300 horse power, but by using refuse quite 400 can be obtained, and regularly it is working at over 300 h.p. for fifteen hours a day. The efforts of the firers are directed, whatever call is being made on the steam by the electrical department, to keep a pressure as near uniform to 130 lbs. as possible, and an automatic register records on a circular chart exactly the fluctuations of the day. Other records are kept, and we find that for the week ending Dec. 5 the gallons of water drawn upon were 10,540, 10,520, 11,600, 10,640 and 12,270 up to the Friday. The average per hour varied in that week from 716 to 920, which give 360 to 460 horse power generated by the burning of pure refuse. The same boiler would consume something like 50 tons of coal weekly, so that there is a saving at once of about £25 to £30 per week.

Ratepayers will naturally desire a word about the cost. Four men are employed at 26s apiece, and two more at 22s. Bonuses are offered which average 30s on the tonnage of refuse and the quantity of water, so that the expenses are perhaps £8 10s per week. The destructor and boiler cost £3,000. Of course, owing to the high

temperatures, the depreciation and repairs are heavy, but on the principle that what burns out one buys another, on the saving effected this system is really cheaper in the end.

With the incidental repairs, the life of such a furnace is five to seven years. It has now been working nine months, and some of the bricks recently taken out were in no way burnt, but the face edge was encrusted with a clinker as hard as flint. The fire never goes out unless the boiler is to be cleaned, and then it is relighted with the baskets found in the refuse. At the end of the day's shift at midnight, the furnace is banked up, and at seven or so in the morning there is the cleaning and raking, and at nine the real firing work re-commences. No doubt it would be as easy to make a cycle of the twenty-four hours, but the electricity department do not need steam for the whole of the twenty-four. The full capacity of the boiler's steam is drawn upon. If there is a surplus one of the electricity department's boilers is relieved, thus saving coal there. By such a method we find the town's refuse thoroughly and harmlessly destroyed, a saving of coal by the harnessing of the heat, and, moreover, the resulting material is useful in several ways.

The steam is supplied directly to the electricity department of the corporation, through a 6-inch steel main, a reducing and regulating valve being provided so as to maintain a steady 130 pounds pressure to the engines.

The plant at the electricity station is as follows: In the boiler house there are at present five Lancashire boilers 28 feet long by 7 feet in diameter. There are also two economizers, one of 190 tubes, and one 120 tubes.

In the engine house are three horizontal compound condensing engines, and two Belliss and Morcom's engines, direct coupled. The horse power is said to be two of 150, one of 200 and two of 450.

The tram line at present in operation consists of about ten miles of track, extending from Padiham on the south to Nelson on the north, and also a short length to Rosegrove, via Accrington-road. Two other lengths, viz.: Manchester-road and Todmorden-road, will shortly be opened. The Manchester-road length has a long and very heavy gradient, whilst in other parts the gradients are numerous and in several parts severe.

The lines will serve a population, including Nelson, Brierfield and Padiham, of upward of 150,000.

The records of the refuse destructor for a week show the following results:

Total refuse burned, including the refuse used for banking fires from midnight to 9 a. m., 209 tons, or 468,160 pounds.

Refuse burned per hour, 5,202 lbs.

Refuse burned per square foot of grate per hour, 52 lbs.

Total water evaporated, 803,300 lbs.

Water evaporated per hour (90 hours per week), 8,925 lbs.

Water evaporated per pounds of refuse consumed, 1.71 lbs.

Equivalent water evaporated from and at 212 degrees F., 2 lbs.

Water evaporated per hour in the 12 hours from noon to midnight, 9,72 lbs.

Total water evaporated in 12 hours from noon to midnight, 700,300.

Steam pressure average 150 lbs., always over 130 lbs.

Temperature in combustion chamber, over 2,000 degrees F.

Temperature in main flue leading to chimney after passing regenerator, 650 to 940 degrees F.

CEMENT AND CONCRETE

Ingalls Building—New York Building Regulations—Concrete Factory—Cement Manufacturers at St. Louis—Cement Paving Brick—Indianapolis Testing Laboratory.

The Concrete Steel Construction of the Ingalls Building, Cincinnati.*

By H. C. Brubaker, Indianapolis, Ind.

This committee was instructed to investigate and report on the bold project of building a sky-scraper, sixteen stories high, entirely of re-enforced concrete, and without a structural steel member. The ambitious plans of the promoters are no less striking, now that their plans have been carried out with success.

A monolithic mass, 100 by fifty feet in plan—twenty-one feet below grade, and 210 above grade—in which the footings, columns, walls, girders, beams and floors are all one and the same, differing only in shape and position, and continuous, without a joint or break, from the foundation to the cornice, and built of particles, so to speak, all of which could pass through a one-inch screen, with no member larger than three and one-half inches in diameter, is a marvel which rivals the pyramids.

The system used throughout the building is the Ransome system, which consists of twisted bars embedded in concrete. The columns are from 12 by 12 to 34 by 38 inches, and carry as high as 750 tons at the footings. The column stools are built of cast iron embedded in concrete and are particularly interesting in design. The sizes of the columns were limited by the architectural design, and the deficiency in strength was made up by the iron bars, there being from four to eight 3½-inch bars to each column, bound together by hoops of wire each 12 inches in height. The girders have as large spans as 33 feet and are from 27 to 36 inches deep, including thickness of floor, which is from 5 to 7 inches. The columns are spaced 16 and 33 feet. Intermediate beams make the floor panels 16 by 16 feet. The loads on the floors were figured at 60 to 80 pounds per square foot for the upper floors, and 300 pounds for the first floor. The exterior walls between piers are 8 inches thick and some walls next to adjoining buildings are as little as 3 inches thick. Of course, these walls carry no loads.

The first to third stories are veneered with marble, which is supported by projections from the concrete fitting into grooves in the marble. The upper stories are veneered with brick, which is supported at each story height by a ledge of concrete.

The general features are strikingly similar to steel cage construction; in fact, the design is the same, and the loads, strains and stresses are figured in the same manner.

It is hardly our province to predict the weathering of this structure. Time only will prove its durability. But the large amount of money was expended, and the enormous responsibility was assumed by men, who evidently were thoroughly convinced of the success of their undertaking.

The same contractors (the Ferro-Concrete Construction Company) are building a factory building for the American Book Company in Cincinnati five stories high, with a floor load of 400 pounds per square foot. An interesting incident in this connection is the fact that they bid for this building in competition with mill construction and were only 4 per cent higher than the bids for mill construction. The writer is at a loss to understand this small difference in cost between the two constructions, and is inclined to believe that they took the contract at little or no profit.

*Read before the Indiana Engineering Society.

Regulations of New York City for Concrete Steel Construction.

Mr. Henry S. Thompson, Superintendent of Buildings of Manhattan Borough, New York City, has adopted the following regulations for concrete-steel construction in buildings:

1. The term "concrete-steel" in these

regulations shall be understood to mean an approved concrete mixture reinforced by steel of any shape, so combined that the steel will take up the tensional stresses and assist in the resistance to shear.

2. Concrete-steel construction will be approved only for buildings which are not required to be fireproof by the building code, unless satisfactory fire and water tests shall have been made under the supervision of this bureau. Such tests shall be made in accordance with the regulations fixed by this bureau and conducted as nearly as practicable in the same manner as prescribed for fireproof floor fillings in Section 106 of the Building Code. Each company offering a system of concrete-steel construction for fireproof buildings must submit such construction to a fire and water test.

3. Before permission to erect any concrete-steel structure is issued, complete drawings and specifications must be filed with the Superintendent of Buildings, showing all details of the construction, the size and position of all reinforcing rods, stirrups, etc., and giving the composition of the concrete.

4. The execution of work shall be confided to workmen who shall be under the control of a competent foreman or superintendent.

5. The concrete must be mixed in the proportion of one of cement, two of sand and four of stone or gravel; or the proportions may be such that the resistance of the concrete to crushing shall not be less than 2,000 lbs. per sq. in. after hardening 28 days. The test to determine this value must be made under the direction of the Superintendent of Buildings. The concrete used in concrete-steel construction must be what is usually known as a "wet" mixture.

6. Only high-grade Portland cements shall be permitted in concrete-steel construction. Such cements, when tested neat, shall, after one day in air, develop a tensile strength of at least 300 lbs. per sq. in., and after one day in air and six days in water shall develop a tensile strength of at least 500 lbs. per sq. in.; and after one day in air and 27 days in water shall develop a tensile strength of at least 600 lbs. per sq. in. Other tests as to fineness, constancy of volume, etc., made in accordance with the standard method prescribed by the American Society of Civil Engineers' committee may, from time to time, be prescribed by the Superintendent of Buildings.

7. The sand to be used must be clean, sharp grit sand, free from loam or dirt, and shall not be finer than the standard sample of the Bureau of Buildings.

8. The stone used in the concrete shall be a clean, broken trap rock, or gravel, of a size that will pass through a ¾ in. ring. In case it is desired to use any other material or other kind of stone than that specified, samples of same must first be submitted to and approved by the Superintendent of Buildings.

9. The steel shall meet the requirements of sec. 21 of the building code.

10. Concrete-steel shall be so designed that the stresses in the concrete and the steel shall not exceed the following limits:

	Lbs. per sq. in.
Extreme fiber stress on concrete in compression	500
Shearing stress in concrete	50
Concrete in direct compression	350
Tensile stress in steel	16,000
Shearing stress in steel	10,000

11. The adhesion of concrete to steel shall be assumed to be not greater than the shearing strength of the concrete.

12. The ratio of the moduli of elasticity of concrete and steel shall be taken as 1 to 12.

13. The following assumption shall guide in the determination of the bending moments due to the external forces: Beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates, when constructed continuous and when provided with reinforcement at top of plate over the supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than WL-10; the bending moment may be taken at WL-20 in the case of square floor plates, which are reinforced in both directions and supported on all sides. The floor plate to the extent of not more than ten times the width of any beam or girder may be taken as part of that beam or girder in computing its moment of resistance.

14. The moment of resistance of any concrete-steel construction under transverse loads shall be determined by formulae based on the following assumptions:

(a) The bond between the concrete and steel is sufficient to make the two materials act together as a homogeneous solid.

(b) The strain in any fiber is directly proportionate to the distance of that fiber from the neutral axis.

(c) The modulus of elasticity of the concrete remains constant within the limits of the working stresses fixed in these regulations.

From these assumptions it follows that the stress in any fiber is directly proportionate to the distance of that fiber from the neutral axis.

The tensile strength of the concrete shall not be considered.

15. When the shearing stresses developed in any part of a concrete-steel construction exceed the safe working strength of concrete, as fixed in these regulations, a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to shear is overcome.

16. When the safe limit of adhesion between the concrete and the steel is exceeded, some provision must be made for transmitting the strength of the steel to the concrete.

17. Concrete-steel may be used for columns in which the ratio of length to least side or diameter does not exceed twelve. The reinforcing rods must be tied together at intervals of not more than the least side or diameter of the column.

18. The contractor must be prepared to make load tests on any portion of a concrete-steel construction, within a reasonable time after erection, as often as may be required by the superintendent of buildings. The tests must show that the construction will sustain a load of three times that for which it is designed without any sign of failure.

A Concrete Factory Building.

The Central Felt & Paper Company has completed at Borden-ave. and Dutch Kill Creek, Long Island City, a building, the main room of which has a clear span of fifty-one feet and is 175 feet long. The beams and the ceiling are entirely of concrete.

The general nature of the soil in Long Island City is soft and spongy. Buildings adjoining the tracks of the Long Island railroad have suffered considerably from the vibration caused by passing trains. In the case of the concrete building the tracks pass directly in its rear. The builders maintain that its solidity is its principal feature. The foundations were made by driving piles twelve inches apart over the entire plot. On these was constructed a solid floor of concrete eighteen inches thick.

The walls of the factory were made first of rough planks nailed to uprights eighteen inches apart. Into this trough the mixture—1 cement, 2 sand and 5 fine cinders—was shoveled, pounded and allowed to set for three days. At the end of this time the board walls were knocked off, and the solid wall of hardened concrete remained.

The problem of constructing the ceiling over the large machine room, in which are to be the huge rollers transforming the pulp into finished paper, was the most difficult which builders with concrete have yet been called upon to solve, says a writer in the Iron Age.

Beams of solid concrete were planned, fifty-one feet long, thirty inches deep and fifteen inches wide, to be placed at intervals of sixteen feet along the entire distance of 175 feet. Timbers were set up on the floor of the machine-room reaching to the level of the ceiling. On these uprights were laid 15-inch planks, and boards thirty inches wide were nailed to them. Into these troughs the concrete, 1 cement, 2 sand, 4 stone, was then shoveled. Favoring weather caused these beams to set in less than three days. The uprights were knocked from underneath them, the bottom and side planks of the trough dropped off, and the finished concrete beams, over fifty feet in length, were fast to the concrete walls. The stiffening used was in the form of small iron rods, placed in rows of three in the lower and upper portions of each beam.

A wire mesh was then fastened between the beams, half way between the top and bottom. The mold of boards was again put in position, and the ceiling was completed.

The factory was first planned to be a brick and frame building, and an insurance company quoted a rate of 1 per cent with a full sprinkler system installed. The rate the same company now offer for the concrete structure is one-twentieth of 1 per cent, although no provision has been made for the sprinkler system.

Exhibit of the Portland Cement Manufacturers.

The building comprising the exhibit of the Cement Industries, at the Louisiana Purchase Expositon, is located on the main line of approach to the "Outside Mining Exhibit," and thus visitors to the latter will pass directly through the Cement Industries Building, the space be-

tween the halls forming a gateway to the outside exhibit.

The building consists of three halls, separated by two courts, and connected across the front by a continuous arcade. The Spanish Mission style seems naturally called for, as an expression of the constructive idea imposed by the use of concrete; and the position of the various halls is indicated on the facade by low pitched gables, characteristic of that style. The connecting links are simply roofed with cement tiles, cast in the Spanish pattern, and will form an agreeable color contrast. The construction from foundation to piers is to be entirely of concrete, and the more ornamental parts and mouldings being of artificial stone, composed of Portland cement. The chief constructive parts are the beams supporting the roof. These have a span of thirty feet, and are designed to be cast on the ground, and erected in the same manner as steel or wooden beams for the same purpose. These beams will, of course, be reinforced by steel rods, as indeed will be portions of the walls and piers; and the whole construction is expected to afford an interesting exhibition of what is sometimes popularly referred to as "poured bulding."

In the rear space, between the building proper and the beginning of the "Outside Mining Exhibit," granitoid platforms will be erected, on which machines used in concrete construction, and forms of concrete construction, suitable for outdoor exhibit, will be shown. The center hall will be used for showing exhibits of cement in all stages of manufacture, together with a display of drawings, photographs, etc., of Portland cement plants, including interiors, quarries, and cement and concrete work, both completed and in process of construction. The smaller hall, at the extreme right of the arcade, will be used for a complete testing laboratory, with necessary apparatus, under the charge of a competent engineer. The corresponding hall on the left, it is proposed to reserve as a meeting place for engineers, architects, contractors, etc., in fact for any and all who are interested in cement and concrete construction. Here the leading trade papers will be on file, and it is trusted that this will be found an attractive place of meeting for all friends of the association.

It is believed that the finished building will present an attractive appearance, and awaken still greater interest in cement as the building material of the age.

Cement Paving Brick.

The commission in charge of the River Vistula, in Germany, has for a long time occupied itself with the production of artificial stone. This was due to the considerable increase in price of natural stone. In addition to this, work had to be found for a number of men during the periods of high water of the river. As a result of numerous experiments the following conclusions have been arrived at: For the materials, only clean, dry, sharp sand or gravel should be used. For binding material a slow setting cement, stored in barrels, must be employed. The cement must be freshly prepared. The proportions are: One part of cement to six or seven parts of sand, according to the size of the grains. When gravel is used the proportions are changed to the extent that one part of cement is used for five parts of sand and two of gravel. In the preparation the materials must be mixed dry, this is followed by slowly adding from thirty to thirty-three gallons of water to the cubic yard of dry material, taking care that the water is thoroughly and equally distributed. When the molds are filled the material is tamped until water appears on the surface. After the material is well tamped the upper surface is struck smooth and the mold is lifted off and the surfaces and corners smoothed. While the piece is hardening it must be kept wet the whole time and this hardening period must be at least of four weeks' duration. No piece may be taken for use in less than four weeks and it is desirable that the artificial stone should be allowed to set through the winter before using. The place where the work is carried on should be level and lie high and so large that there is room enough for the year's supply for one district. The most suitable ground for this is a turf, a fat clay, or a damp sandy soil. The size of the stone should be kept as closely as possible to 15¾x15¾x9⅞ in. The molds must be quite stiff, there must not be any possibility of any of the parts bending or spreading while the material is being tamped. The tampers should be broad and weigh about forty to fifty pounds. In laying these stones wood implements are used and no iron tools. The foundation which is found most suitable is gravel from six to eight inches deep.

ORGANIZATIONS AND INDIVIDUALS

The Engineering Building—The Electric Club—Good Roads Convention—International Engineering Congress—Civic Week at the St. Louis Exposition—Civil Service Examinations—Technical Meetings—Personal Notes.

The Engineering Building.

The offer of Mr. Andrew Carnegie to donate $1,500,000 for the erection of a union engineering building has been accepted by all the national engineering societies and the Engineers' Club of New York City, with the exception of the American Society of Civil Engineers. The total amount involved in the undertaking will reach $2,500,000. In addition to the sum given by Mr. Carnegie more than $500,000 represents the investment in land for the three societies, and the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Mining Engineers, in W. Thirty-ninth street, between Fifth and Sixth avenues, while the Engineers' Club has acquired land in W. Fortieth street, facing the new Public Library, now in course of construction.

The Electric Club.

The Electric Club of Pittsburg, Pa., is now about two years old and has over five hundred members drawn from the group of electric industries near Wilkinsburg. It holds many meetings, and lectures are given in the club's assembly-room as often as once or twice a week. The club has started a monthly journal to print the best of the current work and other appropriate electrical literature.

Good Roads Convention.

A joint convention was held March 16 and 17 in Erie, Pa., of the New York and Chicago Road Association, the Erie Chamber of Commerce and others interested, entitled the "First National Convention for Continuous Lines of Inter-State Roads." Among the speakers were Col. A. A. Pope, of Hartford, Conn., on "Transportation;" Senator Lattimer, of South Carolina, upon the good roads bill of which he has charge in the Senate; Frank Z. Wilcox, of Syracuse, N. Y., on the necessity of national aid; Frank D. Lyon, special examiner of highways, on the construction of State aid roads in New York; Joseph W. Hunter, State Highway Commissioner, on the methods of operation in Pennsylvania; Col. W. L. Dickinson, president of the Connecticut Valley Highway Association, on "Continuous Lines of Improved Inter-State Roads Built by the Co-Operation of the National and State Governments with the Counties, Cities and Towns."

The International Engineering Congress.

The International Engineering Congress will be held Oct. 3 to 8, 1904, under the auspices of the American Society of Civil Engineers in conjunction with the Louisiana Purchase Exposition at St. Louis, Mo. Charles Warren Hunt, 220 W. Fifty-seventh-st., New York City, is the secretary of the committee in charge. A series of thirty-three subjects with many additional subdivisions is given as covering the ground to be considered during the week and memberships in the Congress at $5. Early application for membership is desirable that all announcements and programs may be received.

Papers from the standpoint of American Practice have already been assured on the various subjects as follows:

Harbors, Natural Waterways, Artificial Waterways and Fortifications—By officers of the Corps of Engineers, U. S. A.

Lighthouses and Other Aids to Navigation—By Officers of the Lighthouse Board, U. S. A.

Ordnance—By Officers of the Ordnance Department, U. S. A.

Surveying—By Officers of the U. S. Coast and Geodetic Survey.

Naval Architecture—By Rear Admiral W. L. Capps, Chief Constructor, U. S. N.

Dry Docks—By Rear Admiral M. T. Endicott, Chief of Bureau of Yards and Docks, U. S. N.

Traffic on Improved Waterways, etc.—By Edward P. North, New York City.

Purification of Water for Domestic Use—By Allen Hazen, New York City.

Purification of Water for the Production of Steam—By J. O. Handy, Pittsburg, Pa.

Turbines and Water Wheels—By Prof. Gardner S. Williams, Ithaca, N. Y.

Irrigation—By Elwood Mead, Chf. Irrigation Investigations, Washington, D. C.

Railroad Terminals—By Elmer L. Corthell, New York City.

Underground Railways—By William Barclay Parsons, New York City.

Locomotives and Other Rolling Stock—By George Gibbs, New York City.

Live Loads for Railroad Bridges—By Henry W. Hodge, New York City.

The Substitution of Electricity for Steam as a Motive Power—By James G. White, New York City.

Sewage Disposal—By George W. Fuller, New York City.

Disposal of Municipal Refuse—By Rudolph Hering, New York City.

Ventilation of Tunnels—By Charles S. Churchill, Chief Engineer, Norfolk & Western Railroad, Roanoke, Va.

Highways—By James Owen, Newark, N. J., and William E. McClintock, Boston, Mass.

Concrete and Concrete-Steel—By Edwin Thacher, New York City.

Deep Foundations—By John F. O'Rourke, New York City.

The Manufacture of Steel—By William Metcalf, Pittsburg, Pa.

Tests of Materials of Construction—By William R. Webster, Philadelphia, Pa.

Passenger Elevators—By Thomas E. Brown, New York City.

Pumping Machinery—By Irving H. Reynolds, Youngstown, O.

Dredges: Their Construction and Performance—By A. W. Robinson, Montreal, Can., and F. B. Maltby, Memphis, Tenn.

Electrical Power-Generating Stations and Transmission—By L. B. Stillwell, New York City.

Engineering Education—By Prof. Robert Fletcher, Hanover, N. H., and Prof. Calvin M. Woodward, St. Louis, Mo.

Wharves and Piers—By John A. Bensel, New York City.

Civic Week at the St. Louis Exposition.

A feature of the program for "Civic Week" at the Louisiana Purchase Exposition is the program giving the objects and aims and the progress made toward attaining them, of the various national societies devoted to civic improvement. The American Society of Municipal Improvements will be represented on the program by Charles Carroll Brown, member Am. Soc. C. E., editor Municipal Engineering, Indianapolis, second vice-president; the American League for Civic Improvement by Professor Charles Zueblin of the University of Chicago; the American Park and Outdoor Art Association by Charles Mulford Robinson of Rochester, N. Y., secretary; the National Municipal League by Clinton Rogers Woodruff of Philadelphia, secretary; the American Institute of Social Service by Dr. Josiah Strong of New York, president, and the League of American Municipalities by John M. Head, mayor of Nashville, Tenn.

In addition to these subjects, Professor Samuel E. Sparling of the Wisconsin State University will discuss the municipal or civic problem from the political point of view, Dr. Frank Mason North of New York from a religious point of view, and Amasa M. Eaton of Providence, R. I., from a legal point of view. Other papers prepared from administrative, improvement and sociological points of view are expected. The full program will be issued at an early date.

The sessions will doubtless be held in one of the halls in the "Model Street," the success of which seems now to be assured.

Civil Service Examinations.

The United States Civil Service Commission, Washington, D. C., will hold an examination April 19 and 20 at the usual places in the various States for heating and ventilating draftsmen in the office of the supervising architect of the Treasury Department at $1,200 a year; also for architectural draftsmen at $1,500 and a writer of specifications and computer at $1,200 in the department of the quartermaster at large in Washington.

Technical Meetings.

The New England Water Works Association held a meeting at Tremont Temple, Boston, March 9. A paper on "Experiences" was read by Charles H. Eglee. It treated of hydraulic engineering. Freeman C. Coffin opened a topical discussion on "Rates for Metered Water" and Edward H. Cowan, superintendent of water works at Marion, O., spoke on "The Detection and Prevention of Water Waste."

The eighth annual convention of the League of American Municipalities will be held in East St. Louis, Ill., Oct. 4, 5 and 6.

The eighth annual convention of the

Minnesota Engineers' and Surveyors' Association was held in St. Paul Dec. 24. Among the papers read were the following: "Good Roads," Prof. W. R. Hoag of the State University; "Sewage Question in Cities," Dr. H. M. Bracken of the State Board of Health; "The Position of County Surveyors from the Standpoint of an Editor," Israel A. Herrick of Farmington.

The Association of Portland Cement Manufacturers held a quarterly meeting March 8 at the Hotel Walton, Philadelphia. In the absence of President J. B. Lober, Vice-President A. F. Gerstell occupied the chair. The fire-resisting power of concrete and steel as distinguished from hollow tile and steel construction was discussed at length. Special reference was made to buildings in the Baltimore fire that withstood the flames because they had been built of concrete and steel. The necessity of an impartial investigation of the matter was urged. Among the papers read were the following: "Grinding," George W. Frazier of the Kent Mill Company; "The German Cement Manufacturers' Association," S. B. Newberry of the Sandusky Portland Cement Company. On the evening of March 9 Robert W. Lesley, former president, gave a dinner to the association at his country place, "Lesselyn," Haverford, where a paper was read by Prof. J. W. Richards of Lehigh University on "Cement Burning." A silver loving cup was presented to Mr. Lesley by his fellow associates.

The Indianapolis Technical Club has been organized by the civil, mechanical, electrical and mining engineers, architects, managers and superintendents of railroads, mills and manufactories and chemists of the city, and promises to be a permanent feature of the technical progress of the city. Meetings are held on the second and fourth Saturdays of each month. Charles Carroll Brown, C. E., is president; Walter Buehler, assistant city engineer, is corresponding secretaary, and Harry B. Marsh, E. E., is recording secretary.

Personal Notes.

A. M. Owens, former mayor of Enterprise, Ala., has been elected to that office again.

James T. Rice has been elected chief engineer of water works at Cape May, New Jersey.

The Hon. Flavius O. Beal has been re-elected mayor for the eighth time at Bangor, Me.

George Ellis has been appointed superintendent of the municipal water works system at Canandaigua, N. Y.

William R. Ryon, local manager of the Barber Asphalt Paving Company at Peoria, Ill., died March 10, aged forty-two years.

George H. Reynolds of Marshfield, Wis.; J. P. Malock of Stevens Point, and G. C. Knotter of Dancy have been appointed drainage commissioners.

City engineers have been elected and re-elected as follows: A. B. Stevens, Jackson, Mich.; H. J. Harder, Paterson, N. J.; D. F. A. Wheelock, Warren, Pa.; George W. Sykes, Beaumont, Tex.

Winslow Herschel, recently connected with the engineering work at Jerome Park reservoir, New York, has sailed for Europe and will act as local agent and technical correspondent of the Allis-Chalmers Co. at Zurich.

Charles Allis has resigned as president of the Allis-Chalmers Co. on account of the ill health of his wife, which necessitates a trip abroad. He will be succeeded by B. H. Warren, formerly vice-president and general manager of the Westinghouse Electric and Manufacturing Co.

Edward J. Johnson, who has been manager and superintendent of the Sharon & South Sharon Water-works Company for twenty years, at Sharon, Pa., has resigned his position to take effect April 1, and with several practical men is going into business as the Water-works Construction Company, with headquarters at 331 Fourth-ave., Pittsburg, Pa.

Mayors have been elected as follows: William B. Skelton, Lewiston, Me.; A. Q. Miller, Auburn, Me.; Cyrus W. Davis Waterville, Me.; Luther B. Moore, Saco, Me.; James E. Rhodes, Rockland Me.; Alex. C. Haggerthy, Ellsworth, Me.; John H. McFaul, Eastport, Me.; Edward W. Hyde, Bath, Me.; George T. Spear, South Portland, Me.; Edwin L. Russell, Gardiner, Me.; J. W. Fuller, Hallowell, Me.

The Hon. William R. Grace, former mayor of New York City, died March 21 of pneumonia, aged seventy-two years. He was twice elected mayor, in 1880 and in 1884. He was also president or vice-president of numerous corporations, was director in the Lincoln National Bank, the New York Life Insurance Company, the New York & Pacific Steamship Company, which line he established in 1881, in the Brooklyn Warehouse and Storage Company and in the Lincoln Safe Deposit Company.

Village presidents have been elected as follows: George D. Clarke, Vassar, Mich.; Ananias Pouch, St. Johns, Mich.; F. H. Oliver, Allegan, Mich.; M. M. Christie, Capac, Mich.; John R. Cotten, Essexville, Mich.; George W. Clute, Mt. Morris, Mich.; B. F. Jarrard, Holly, Mich.; F. H. Potter, Durand, Mich.; Eugene Hollenback, Maryville, Mich.; John E. Hisey, Laingsburg, Mich.; David Donaldson, Reese, Mich.; Joseph Fremont, Bad Axe, Mich.; B. H. Holmes, Vernon, Mich.; Charles Webster, Ithaca, Mich.

MUNICIPAL AND TECHNICAL LITERATURE

Directory of American Cement Industries—Municipal Reports.

The Directory of American Cement Industries.

The third edition of the "Directory of American Cement Industries" is now passing through the press as rapidly as the printer can be pushed on with the work and will be issued at an early day. The failure of the printer to keep his promises for definite dates makes it advisable not to set the date exactly, but there seems now to be nothing in the way of early publication. As has already been stated, the enormous expansion in the cement trade has vastly increased the labor upon all sections of the directory. This begins with the description of cement plants, nearly every one of those of the second edition being rewritten to bring in the many changes in established factories, and the number of new descriptions equalling the number printed in the first edition. The verification of thousands of new names and the determination of credit ratings for them has also taken much more time than was expected. All the delay of publication beyond the date first set cannot be attributed to the printer, therefore. It is certain that the greater accuracy in the directory and the greater fulness of the lists will amply compensate for the comparatively short delay in publication, and the lists will appear, fresh and complete, in plenty of time for use in the season's trade.

Municipal Reports.

Report of the Chief Engineer of the Board of Estimate and Apportionment of the City of New York, 1902 and 1903. Nelson P. Lewis, Chief Engineer.

This is the first report of this official, the office having been established Jan. 1, 1902, under the revision of the city charter. The report is unique in at least one respect, in that it contains no names of officials other than Mayor George B. McClellan in the address and Chief Engineer Nelson P. Lewis in the signature to the report.

The board and its engineer must pass upon all the projects for municipal improvements in the city. The extent of its responsibilities may be gauged by the number and cost of improvements considered. In 1903 assessable improvements authorized were 435 with an estimated cost of $6,989,000. Brooklyn presented nearly half of the total and Bronx borough more than one-third. The total cost of improvements in 1902 was about the same, though the number was less. The proportion in the various boroughs was approximately the same.

The report treats somewhat at length of the various pavements used and offered, the improvements desired before the 300th anniversary of discovery of the Hudson river, and the activities of the various boroughs, thus giving a very valuable birdseye view of the march of improvement in all parts of the great city. New parks, bridge approaches and improved railroad terminals are the great questions considered in the report.

Full tables give the most prominent data regarding the improvements presented for consideration and the action taken thereon.

Seventh Annual Report of the Board of Trustees, Commissioners of Waterworks, Cincinnati, O., 1903. Aug. Herrmann, Pres.; G. Bouscaren, Chief Engr.

The receipts during the year were $1,717,000, all but about $200,000, being the proceeds of a bond issue. The expenditures were $1,128,455. Thus far $4,079,067 has been spent upon the construction of the new waterworks, including all expenses, interest, administration, etc. The expenditures are classified under 21 items, the principal of which are the California pumping station, $900,000; the gravity conduits, $887,000; engineering, $447,000; settling basins, $375,694; Pendleton pumping station, $332,000. The work is not yet half completed, the total estimated cost being $9,500,000.

The Chief Engineer's report gives details of the three contracts let during the year, amounting to $583,878. These contracts were for the buildings and

chimneys of the western pumping station, coal storage houses and a small contract for piling and bank protection. Progress reports are made on the contracts in hand and on those completed during the year. A report from the chief and consulting engineers on the variation in position of the floor of the pump pit with change in level of the river is given. Weight of pumps and control of water pressure by pumping out during highest floods are to be depended upon to keep the floor in place.

Statistical tables give details of contracts and expenditures.

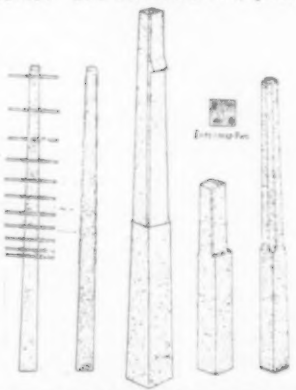
Annual Report of the City Engineer, Cambridge, Mass., Nov. 30, 1903. James Wilson Pierce, City Engineer.

Mr. Pierce was city engineer for half the period covered by the report, L. M. Hastings being his predecessor. Sewers 2.7 miles long were built at a cost of $74,497, not including catch basins. The city engineer's department cost $9,200; sewer maintenance, $18,000; dredging, $2,672. The street work seems to have been done by day labor under the street department, 3,330 square yards of brick pavement and 625 square yards of granite block being reported, without figures of cost, in the city engineer's report.

MACHINERY AND TRADE

The Post Question.

The Hillsdale Fence and Post Company of Hillsdale, Mich., believes that it has solved the fence post problem in the reinforced concrete post invented by J. A. Mitchell. The standard line posts are



FORMS OF MITCHELL'S CONCRETE FENCE POSTS.

3½x5 inches at the bottom and 2½x3 inches at the top and 7 feet long. They are well reinforced with metal rods near the corners, as shown in the accompanying drawing. The fastening of the fence to the post is firm, and is made in such a way that the post can not be broken with the line of fence. The line posts will stand a dead weight of 1,000 pounds when resting on supports about 6 feet apart. The drawing shows the regular line post, corner post, bracing post, a special octagonal post and a cross section of a post.

Mr. Mitchell has also invented a very simple machine for making hollow concrete building blocks 8x9x18 inches in dimensions, and with a hollow 3x12 inches.

The Bitulithic Pavement at Cohoes, N. Y.

The Warren Brothers' Company have been awarded a contract in Cohoes, N. Y., for 22,000 square yards of their patented Bitulithic pavement at $2.48 per square yard, the pavement to be laid in Ontario, Vliet and Mangan-sts.

When the asphalt promoters found there was no hope for the success of their material they turned the full force of their strength and influence in favor of brick. The East Side Taxpayers' Asssociation met the issue squarely and at a largely attended special meeting of its members unanimously adopted resolutions demanding that the Public Improvement Commission award the contract to the patentees of the Bitulithic pavement, the Warren Brothers' Company's bid not only being within the engineer's estimate,

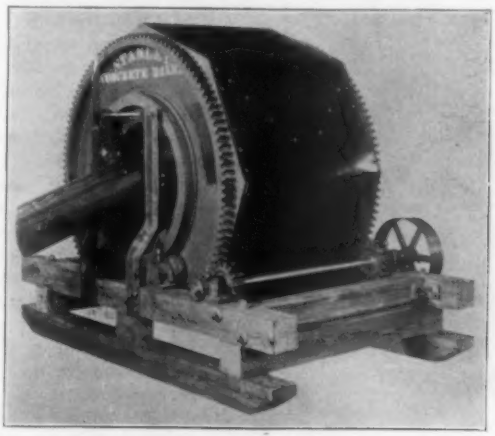
but because the Bitulithic paving was the choice of the taxpayers after a thorough investigation of its merits. The accompanying petition for Ontario-st. contained the names of all but two of the property-owners liable to assessment for the improvement of that street.

Another System of Hollow Concrete Blocks.

The molds manufactured by the Michigan Cement Block Machinery Company were gradually developed in a yard devoted to the manufacture of concrete block. They are the product of practical experience gained in the making of concrete blocks. They do not represent any theories or whims, but are useful only for the purpose for which they are made. The size of block they make, 18x8x9 inches, less ⅜ inch for a mortar joint, combines many good features. This block lays one square foot of nine-inch wall. The number of square feet in the walls of a building give the number of blocks required. This size readily subdivides into half or quarter blocks. As the dimensions of buildings are generally in feet or fractions thereof, the puzzling combinations of blocks containing more or less than a square foot are avoided. The weight of this block, about 50 pounds for plain or sixty for rock face, is as great as one man can manufacture unaided, or a man lay in the wall without a tender.

In many cases the gain made in surface on a large block is lost in the cost of making alone, to say nothing of the increased cost in laying.

The loss in the breakage of blocks in making is one of the worst leaks in the successful manufacture of the hollow block. Thousands of blocks have been made in this mold in the last three years with a breakage loss of less than 3 per cent. This is one of the most valuable features of the system. Blocks made from these molds are in general use in Michigan, one large cement mill having used 5,000 in the past year. Machine shops, boiler rooms, elevator walls, churches, houses, stores, woodsheds, coal houses, ice houses, sheds, hen houses, and other buildings have been thoroughly tested and tried before being placed upon the market.



PRISMATIC DRUM CONCRETE MIXER.

The Stanley Concrete Mixer.

The accompanying photograph shows the discharge end of the Stanley prismatic drum concrete mixer, which was described on page 209 of the March number of Municipal Engineering, and will aid in making clear the method of operation of the machine.

The material is dumped into the machine from barrows at the other end. The chute shown in the picture is tipped up into a position to retain the materials in the mixture while the machine is revolved. When the concrete is thoroughly mixed a lever is thrown which drops the chute into the position shown. It then receives the concrete from the revolving drum as it comes to the upper end of the chute, and discharges it into a barrow or a pile outside.

The machine is shown to be an octagonal prism, not a cylinder. Deflector plates on the inside of the plates of the drum throw the mass of concrete from side to side so that it receives a double turning, equivalent to that in a cubical box swung from two opposite corners.

How Fast Was That Auto Traveling?

The accompanying cut illustrates 36 men from the Washington, D. C., bicycle force—just one-half the squad. Each man's machine is equipped with a Jones Speedometer, which is fitted to the front fork of the bicycle by means of a supporting clamp.

GEAR DRIVE SPEEDOMETER FOR AUTOMOBILE.

Realizing the necessity for an instrument which would tell the policeman the exact speed in miles per hour which he is traveling, as he flies after an offender of the speed law, Major Sylvester adopted the Jones Speedometer in which guesswork is eliminated, since the rider can tell at a glance the speed of any moving vehicle.

Major Sylvester expresses his entire satisfaction with the instrument in a letter to the company manufacturing it.

While this instrument is as necessary to the bicycle police as the bicycle itself, it is also a great acquisition to the automobilist, as it enables him to keep within the speed limit to a certainty.

The gear-drive speedometer, illustrated herewith, is the latest model of speedometer for the dashboard of automobiles, displaying a new device—a gear-drive attachment. The large gear is attached to the front wheel of the car with screws. A smaller gear is carried by a ball-bearing shaft supported on the steering arm by means of an attaching clamp. The speedometer proper is attached to the dashboard of the car in any convenient position, and is connected with the drive gear on the wheel by means of a flexible shaft.

The small gear-shaft support is provided with a swivel base which permits the gears to separate in the event of any obstacle, such as a stone, getting caught in the teeth, thereby preventing any damage to the gears.

Two sizes of this instrument are made, with indicating dials three and four inches in diameter.

This system of gearing makes an absolutely positive drive, and is very durable. By a series of different gears the speedometer may be adapted to any standard wheel from twenty-eight to thirty-six inches in diameter. The change can be made by simply removing a cotter pin and changing the smaller gear for one of different diameter and number of teeth. The advantage of this is obvious, as any dealer carrying a speedometer in stock can, with an extra set of small gears, fit the speedometer to any size wheel, or the owner of an automobile can, by securing a new gear use the same speedometer on different cars.

The speedometer is manufactured by Joseph W. Jones, 127 W. Thirty-second-st., New York.

The Penn-Allen Plant in Operation.

The Penn-Allen Portland Cement Company, of Allentown, Pa., are issuing notices that they have been in operation for several weeks and are beginning to ship cement.

The works of the Penn-Allen Cement Company are situated at Penn-Allen, near Nazareth, Pa., on the tracks of the Lehigh and New England Railroad Company, and are said to be a model plant with a capacity of 1,000 barrels per day, but the mills were originally designed and built to allow for its enlargement to a 2,000 per day capacity, and the present buildings, power plants, shafting, etc., have all been installed with that end in view, and we are informed that the company intends to immediately enlarge its present plant to the 2,000 barrel capacity.

SPEEDOMETER ON BICYCLE.

HALF OF WASHINGTON POLICE BICYCLE SQUAD.

One interesting feature of this new plant is the installation of eighty-foot kilns, which have turned out so successfully that several other mills in the Lehigh region are installing them.

The general offices are at Allentown, Pa., from which place all transactions will be conducted. J. Maxwell Carrere is the general manager.

A Large Shipment of Street Sprinklers.

That street sprinkling wagons have become an essential part of every city's equipment is not denied. They are no longer considered a luxury, the conveniences of which are to be enjoyed only by the more prosperous class of citizens, but a necessity from a sanitary as well as an economical point of view. In the few towns where sprinklers are not in general use, the merchants lose enough money in the decrease of the value of their stock, caused by the "dust devil," to purchase and operate a sufficient force of sprinklers to prevent the dust from attempting to raise itself above its proper level. It is a well-known fact that germs are carried and disease spread by dust when allowed its freedom, and in many cities the Boards of Health have become champions of the street sprinklers, insisting upon their use as a preventive of the spread of disease.

The Austin street sprinkler, manufactured by the Austin Manufacturing Company of Chicago, is one of the best known and most popular machines of this description on the market, and has attained that position through its merits. It is a simple device, but strong and efficient, and is used by a large number of important cities. The accompanying photograph shows a shipment of these sprinklers made to the city of St. Paul, Minn., a single purchase of magnitude sufficient to show the confidence of the city authorities in the efficiency of the apparatus.

A LARGE SHIPMENT OF SPRINKLERS,
Made by Austin Western Co. to St. Paul, Minn.

The United States government uses the Austin sprinklers in Yellowstone Park and many other government posts.

The Austin Steel Street Sweeper has been on the market for over a quarter of a century, and reports indicate that it is also one of the most popular machines of its class.

Sewer-Cleaning, a Vexatious Question.

Many millions of dollars are spent annually building and equipping sewerage in the United States. Maintaining and

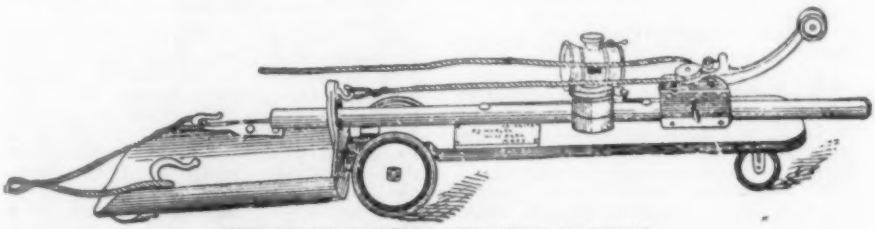
cleaning has been a subject that has occupied the attention of many of the most prominent engineers in the country. It has been brought before the various engineering societies and has been subject to careful consideration from these bodies.

An invention owned and patented by Mr. P. J. Healey of 10 Tremont-st., Boston, has concentrated the attention of the foremost engineers, who have made the subject of sewer cleaning a specialty, and it appears to have their unqualified indorsement.

At a recent meeting of the Boston members of the American Society of Civil Engineers in Boston, Mr. R. S. Door, C. E., chief of the Bureau of Sewers, gave an interesting lecture on this device, using a model in illustrating his remarks. The subject being worthy of more than passing notice, a representative of Municipal Engineering Magazine called on Mr. Door, who stated that he had, as head of the department, watched the work of the machine, which had been adopted after several preliminary trials. The tests were of a very severe nature and had been succesful in cleaning sewers that previous to the Healey invention had to be ripped up. These were twelve and eighteen-inch size and presented a serious problem to the department. As evidence of the rapidity with which this machine can be worked and its general effectiveness, it can be stated that at a demonstration on Union-ave., Brooklyn, on March 14 of last year, there were removed from a three-foot sewer 108 pails of sediment in two hours and a quarter, or at the rate of four pailfuls in five minutes, the distance between manholes being 135 feet, all previous attempts having failed. This being considered the most severe test the Brooklyn department could present, it certainly demonstrates effectively the usefulness and practicability of this utility.

Street and Sewer Commissioners all over the country are unstinting in their praise, Mr. Healey having received the personal indorsements of such as Mr. John Thatcher, Supt. of Sewers, Brooklyn, N. Y.; Mr. Matthew J. Kennedy, Supt. of Maintenance, Brooklyn, N. Y.; Mr. Theodore L. Pike, Supt. of Sewers, City of Cambridge, Mass.; Laforest Beals, Supt. of Streets, Lowell, Mass.; N. K. Thompson, Street Commissioner, Elizabeth, N. J. It has been approved by the officials of the Bureau of Streets and Sewers in Boston and many others.

Mr. Healey is a practical sewerage man, having been foreman with the Metropolitan Sewer Commission of Boston for ten years, and for three years with Sewer Cleaning Department, also of Boston. It was while in this capacity that the inventive genius of the patentee developed, and after many years' study he evolved the present patent.



THE HEALEY SEWER CLEANING MACHINE.

Trade Publications.

Electric coal mining plant and storage battery industrial locomotives are described and illustrated in bulletins 4 and 5 of the Jeffrey Manufacturing Company, Columbus, O. This series of bulletins are of the standard size, 7 by 10 inches, and perforated for insertion in a handy binder.

The special catalogue for 1904 of the Aultman Company, Canton, O., gives the details of their double star traction engine, showing its simplicity and strength.

Baldwin, Tuthill & Bolton, Grand Rapids, Mich., send a 200-page catalogue for 1904 of saw and knife fitting machinery and tools, saw-mill and woodworking machinery, of which they have printed 40,000 copies.

Asphalt, concrete and pitch paving tools and machinery, roofers' kettles, etc., are shown with price lists in catalogue No. 50 of the Contractors' Tool Company, 704 Arch-st., Philadelphia, Pa.

W. E. Caldwell Company's catalogue for 1904 of tanks, towers and tubs has been received.

Catalogue No. 60 of the National Electric Company, Milwaukee, Wis., describes

their alternating current machinery for lighting, power and railway service.

List No. 2 of the Railway and Electric Equipment Company gives lists of their electrical machinery for trolley roads and for lighting and their railway equipment for steam roads, etc. The company has offices in Philadelphia, Buffalo, Chicago, Pittsburg and Cleveland.

The Kent Mill Company, 170 Broadway, New York City, sends a calendar advertising its machine for grinding cement clinker, quartz, limestone, phosphate rock and other hard substances.

Pettijohn Brothers, 1300 N. First-st., Terre Haute, issue a circular descriptive of their machine for making hollow concrete building blocks and the method of operating it, giving also the cost of the machines and of making blocks with them.

Trade Notes.

ASPHALT.

The Dunderberg Asphalt Company, Jones Point, N. Y., has been incorporated by L. C. and L. I. Gillespie, of Morristown, N. J., and J. T. Gillespie, of New York City.

The American Asphalt-Mastic Company, with headquarters at Detroit, Mich., has been incorporated to "manufacture and sell asphalt-mastic or a composition for paving and roofing consisting of asphaltum and lime sludge from purification of beet juice in sugar manufacture." The incorporators are Ammi W. Wright, Alma, Mich.; F. R. Hathaway, Roderick, A. Gurley, Denver, Colo.; Wm. H. Worswick, San Francisco, Cal. The first plant will be built at Alma.

The Walnut Creek Oil and Asphalt Company, Austin, Tex., has been organized to develop asphalt property.

A deposit of asphalt rock on the island of Bahrein, in the Red Sea, is being investigated by the British authorities. Laboratory tests prove it to be satisfactory for paving purposes, showing that the material can be diluted up to 75 per cent. with limestone. The asphalt is too low in grade, however, to be profitably exported to European markets, but it is thought that it can be sold in India at a price which would make its shipment there practicable.

The Barber Asphalt Paving Company will build a stone crushing plant on a site on the East Side known as the Lowery tract, at Minneapolis.

The Wadsworth Stone and Paving Company, which opened up asphalt mines on Green river, about four miles below the town of Glenmore, Ky., is about ready to begin operations.

BRICK.

We are advised by the United States Drying Engineering Company, 66 Beaver-st., New York City, that they have recently closed contracts for a clay drying plant for the Delaware Clay Manufacturing Co., of Delaware, O.; plant for the drying of waste phosphates for the Grasselli Chemical Co., of Tremley, N. J.; an installation for the drying of tobacco stems for the Henderson Tobacco Extract Works, of Henderson, Ky. The company is also installing a shale drying plant for the Elko Paint Co., at Randolph, N. Y.

The board of public works at Peoria, Ill., advocates the establishment of paving brick plant.

W. F. Brennan, deputy commissioner of public works at Chicago, resigned his position March 1 and accepted that of Western agent for the Metropolitan Paving Brick Company, with plants at Canton and Cleveland, O.

The Vitrified Brick Company of Boise, Idaho, has let contracts for additional burning kilns, and will double the present capacity of its plant.

CEMENT.

The Newaygo Portland Cement Co., Newaygo, Mich., has established a general sales office in the Michigan Trust Company Bldg., Grand Rapids, Mich., in charge of George T. Burridge as general sales agent. The company requests that, in order to facilitate the handling of mail and insure prompt filling of orders, that all orders for cement, as well as all correspondence regarding prices and freight rates, be addressed to Newaygo Portland Cement Co., Michigan Trust Co. Bldg., Grand Rapids, Mich., where they will receive prompt acknowledgement and attention.

The Western Portland Cement Works Co. is enlarging its plant at Yankton, S. D.

According to press reports of March 16 a new company is being organized at Carthage, Mo., to manufacture a paving cement from mine tailings. It is not yet known who is at the head of the project.

Henry Wood Bergen of Jackson, Mich., cement expert and chemist for the Peninsular Portland Cement Co., has found, according to local press reports, that the marl deposits in Bass, Zukey and Island Lakes, near Lakeland, are as rich as any yet discovered in Michigan.

The Cairo Sand, Lime and Cement Co., Cairo, Ill., has been incorporated to deal in building materials, by F. J. Fitzgerald, E. A. Patier and E. P. Fitzgerald.

The Pennville Concrete Co., Pennville, Ind., has been incorporated by Elza N. Cary, C. E. Caylor, M. G. McCarty, L. G. Walling and William C. Waltz.

The cement works at Syracuse, Ind., have been overhauled and many changes and repairs that have been contemplated for several years made. The plant will, it is said, work day and night for the next year.

The government has decided to built its own cement plant near the Tonto dam, in Arizona.

Charles Sawyer of Boston, Mass., has

been investigating the field in Clarke County, Alabama, with a view to ascertaining conditions and advantages for establishing a cement plant.

The plan for the reorganization of the Hecla Portland Cement and Coal Company at Bay City, Mich., has been submitted to the stockholders. It provides for the formation of a new company with a capital of $1,000,000.

The Belleville Portland Cement Company, Belleville, Ont., has placed orders for steam turbines for operating its cement works.

The Columbus Cement Company, Columbus, O., has been incorporated by John Albert Jones, William H. Phillips, John C. Sherwood, Walter Page, Jr., and John P. Given.

The quarry property of the Michigan Alkali Company, at Bellevue, Eaton County, Michigan, has been purchased by the Hon. Wellington R. Burt and George R. Burt and an immense Portland cement plant will be built.

The Terrace Park Concrete Company, Cincinnati, O., has been incorporated by J. E. Bellville, C. V. McChesney, L. A. Walton, William Lamb and W. A. Seward.

The Branson Portland Cement Company has purchased 500 acres of valuable marl beds near Schoolcraft, Mich.

The Alsen American Portland Cement Company announces that the firm of Sinclair & Babson has withdrawn from the company's selling agency and that this business will hereafter be conducted exactly as heretofore, including the importation and distribution of the German Alsen, by the Alsen Portland Cement Works, at 45 Broadway, New York City. W. P. Corbett, Secy. and Gen. Mgr.

The Diamond Portland Cement Company, Lincoln, N. J., has been incorporated to manufacture cement by Edgar Granert, Max F. Wirtz and Carrie C. Wirtz.

Messrs. Sinclair and Babson having withdrawn as the selling agents for the Alsen American Portland Cement works, the business will hereafter be conducted directly by the company. Mr. W. P. Corbett is now secretary of the Alsen Company and General Manager of Sales. He has taker charge of same with offices as heretofore, 45 Broadway, N. W. Business will be conducted as before and those having previous dealings with that company, will find Mr. Corbett in every way up to the usual "Alsen standard" in hospitality and businesslike qualifications.

CONCRETE BLOCKS.

The Contractors' Tool Company, 704 Arch-st., Philadelphia, Pa., advises us that it is issuing a new catalogue of asphalt and roofers' tools and machines, and also one for cement pavers.

The Brady Cement Stone Machine Company of Jackson, Mich., contemplates building a large plant at Louisville, Ky., for manufacturing cement building blocks.

The Columbus Cement Stone Company, Columbus, O., has been incorporated by John Albert Jones, William H. Phillips, John C. Sherwood, Walter Page, jr., and John P. Given. The company will manufacture cement stone for all purposes.

The Fond du Lac Cement Brick Manufacturing Company has been incorporated at Fond du Lac, Wis., by A. C. Dallman, Joseph Hutter, John Hutter and E. F. Cooper.

The plant of the Perth Amboy Cement, Stone & Roof Tile Company, Perth Amboy, N. J., is to be greatly enlarged and improved. C. C. Christensen is president, George W. Yepsen secretary and A. Hansen treasurer.

The Rock County Concrete Stone Company, Janesville, Wis., has been organized to manufacture building materials from cement by Grant U. Fisher, Evan D. Roberts and Frank J. Mouat.

The Freeport Concrete Construction Company, Freeport, Ill., has been incorporated.

The Medina Concrete Company, Medina, O., has been incorporated to manufacture concrete building blocks, by B. Felton, Clare R. Warner and Walter Kennedy.

The Lansing Artificial Stone Company, Lansing, Mich., has been organized to manufacture cement brick.

I. L. Shaw of Gibson, Ill., has invented a machine for molding concrete building blocks.

The citizens of Liverpool, O., are interested in a proposition to establish a plant in the East End for manufacturing cement building blocks. John Scott and Prof. R. E. Rayman are interested.

A company is being formed at Detroit, Mich., to erect a number of plants throughout the States of Michigan and Ohio for the manufacture of cement brick.

The establishment of a plant at Glassboro, N. J., for the manufacture of cement building blocks is contemplated.

F. M. Johnson, of Minneapolis, and L. Hallum will establish a plant at Fosston, Minn., this spring to manufacture cement sidewalk blocks.

A plant for the manufacture of cement blocks and walks is proposed at Grand Island, Neb.

The Pressed Stone Manufacturing Company, recently incorporated at St. Paul by George W. Oaks, W. S. Darby, B. S. Oaks and others with a capital of $50,000, have closed a contract whereby they secure a complete power equipment for the manufacture of the Miracle Hollow Concrete Blocks, which will be installed in St. Paul, on the ground they have secured on the C., St. P., M. & O. right of way, on the West Side. They will also control the sale of these machines and the product, under the Miracle patents, in all the southern part of Minnesota, except a few counties in the immediate vicinity of Minneapolis, which have been reserved for Minneapolis territory.

J. O. Waterworth of Waterworth & Fee, of Duluth, Minn., has purchased an out-

fit for the manufacture of the Miracle Hollow Concrete Building Block, which will be installed at Duluth in a very short time. Waterworth & Fee are practical cement men, as well as heavy contractors, and are going into the business on an extensive scale.

LIGHTING AND POWER.

The Ottawa Construction Company, Toledo, O., has been incorporated to build electric light and power plants and railways, by S. W. Cook, Wm. E. Brown, Geo. W. Pearson, John Quaife, and Samuel Hourt.

The California Gas & Electric Corporation, San Francisco, Cal., purchased the Standard Electric Company of California and the United Gas & Electric Company of San Jose.

Newly incorporated electric light companies: Monroe Water and Light Company, Monroe, Wash.; Marion, Bucyrus & Tiffin Railway and Light Company, Bucyrus, O.; Carthage Heat, Light & Power Company, Carthage, Mo.; Nassau Gas, Heat and Power Company, New York City; Seaboard Gas Company, Camden, N. J.; Western Water and Power Company, Chicago, Ill.

J. C. Waugh of Moline, Ill., has been granted a patent on an acetylene gas-making machine.

The Nernst Lamp Company, of Pittsburg, Pa., has opened an office and salesroom at No. 7 W. Mohawk-st., Buffalo, N. Y., where the above mentioned company intends to carry at all times a full line of lamps and parts for the purpose of supplying the trade.

Mr. G. E. Bennett, formerly Assistant Manager of the Chicago office, has been appointed district salesmanager of the Buffalo office of the Nernst Lamp Company.

MACHINERY AND MATERIALS.

We are directly advised that the following people are interested as possible buyers of machinery and tools as follows:

C. E. Chandler, Eureka, Kas., cement block machine and small mixer.

W. J. Gilmore, Tipton, Ia., cement finishing tools.

Gray & Stewart, Portland, Ind., wheelbarrows, shovels, picks and cement finishing tools.

Allen & Allen, Washington, Ind., concrete block machine.

Salina Hydraulic Stone and Brick Company, Salina, Kas., hollow block molds.

George W. Miller, 802 Equitable Bldg., Des Moines, Ia., concrete construction machinery.

George W. Powell, box 40, Warren, Ind., machinery for brick, stone and cement work.

W. S. Haynes, of Samuel W. Black & Co., Pittsburg, Pa., concrete block machinery.

W. B. Worley, Oxford, Miss., machinery for laying concrete pavements.

J. W. Schwartz, Shenandoah, Ia., tools for paving and cement.

A. P. Deure, Corning, Ia., tools for manufacture of artificial stone, cement and lime.

J. F. Plew, Vevay, Ind., trowels, tampers, jointers, edgers and all other tools for cement work.

W. L. Harding, Charleston, Ill., band saw, paving planer and sticker.

H. C. Friend, 813 E. Lexington-ave., Ashland, Ky., tools and machinery for erection of cement houses.

E. Kenney, Creston, Ia., cement building blocks and other artificial stone.

W. F. Dallison, Bedford, Ia., cement blocks and sidewalk machinery.

J. M. King, machinery for artificial stone work.

A. H. Brown, Cresco, Ia., all kinds of cement tools.

W. H. Faulkner, Fairfield, Ia., stone crushing machinery.

John Pro, Spencer, Ia., hollow concrete block machine and sidewalk tools.

Frank Ferren, 1319 Fourteenth-st., Des Moines, Ia., finishing tools.

W. E. Junker, Princeton, Ind., cement tools.

R. B. Bonce, Great Bend, Kas., cement block machinery.

R. G. Jacobs, Flemingsburg, Ky., paving tools.

Adam Vilmes, Le Mars, Ia., cement workers' tools.

G. P. Frysberger, Bloomfield, Ia., cement building block machinery.

C. B. Millenie, Fairfield, Ia., hoisting machine and bricklayers' tools.

F. Steinhart, 209 James street, Blue Island, Ill., concrete mixer.

Springfield Hydraulic Stone Company, Springfield, Ill., gas engine and mixer.

H. O. Bench Corporation, New London, Conn., brick hand press for making face brick of cement.

Noah Bogard, 1400 E. Grove street, Washington, Ind., concrete mixer, sidewalk and curbing tools of all kinds.

Joseph Trompeter, Peru, Ill., concrete mixer, surveying instruments, tools, etc.

J. A. Thornton, Morgan City, La., engines and steel castings.

Frost & Son, Jerseyville, Ill., building block machinery.

Frank J. Rice, Norwich, Conn., hollow cement blocks, rock face, machinery.

Moran & Hardy, Lake Forest, Ill., all tools used in cement work.

A. H. Beidelman, Naperville, Ill., concrete mixer and hoisting machine.

M. F. Murphy, Normal, Ill., cement sidewalk, posts and blocks.

Lord Fuel & Ice Company, Monmouth, Ill., hollow block machine and sidewalk blocks.

John Kellie & Co., 702 Michigan-ave., Detroit, Mich., mixers.

Peter Fillion, 1519 S. I street, Bedford, Ind., concrete mixer.

Frederick S. Brown, 740 La Salle street, Chicago, Ill., concrete building block machine.

J. H. McCulloch, 1014 Marshall street, Paris, Ill., hollow block machine.

Fuller Bros., Frostburg, Md., hoisting engines, concrete mixer, cement tools.

Gabriel A. Chamblin, 254 N. Royal street, Mobile, Ala., hoisting machine and cement tools

Joseph S. Hamilton, 605 Franklin-st., Wilmington, Del., concrete block machine, tools and forms.

E. F. Burnham, Paw Paw, Mich., block and tile machines and tools.

C. W. Sheatsley, 104 Grant-st., Niles, Mich., cement machinery.

D. W. Mellen, 22 Dwight-st., Springfield, Mass., concrete mixer.

Edward L. Suiter, 410 E. Oak-st., Fort Collins, rock crushers and concrete mixer.

E. Miller, 902 Northwestern Bldg., Minneapolis, Minn., hoisting machine and derricks.

Clarence W. Coats, 727 Wisconsin-ave., Lansing, Mich., building block machines.

C. J. Stone, Kingsbury, Cal., pumping plants.

John H. Hansen, Box 9, Wallace, Idaho, hollow concrete block machine.

Charles Vogel, Wheaton, Ill., cement block machine.

John Sweeney, Hingham Centre, Mass., all kinds of machinery for quarry and stone work.

F. W. F. Woolicott, 5 Thornton-st., Winthrop, Mass., machinery for general contracting.

B. L. Ralph, Savannah, Mo., machinery for making hollow concrete blocks.

Bagley & Bagley, Santa Rosa, Cal., concrete mixer and concrete block machine.

Congdon Construction Company, 313 Hennepin-ave., concrete mixer.

Evans Smith, Monroe City, Mo., concrete block machines.

Edward Ottoman, 306 S. Haven-st., South Haven, Mich., concrete mixer.

W. L. Bond, Monroe City, Mo., stone block machine.

C. K. Anderson, 605 Vine-st., Owatonna, Minn., hollow building cement block and sidewalk tile machinery.

J. D. O'Connell, 424 Manhattan Bldg., Duluth, Minn., grading and sewer trench machines.

We have direct advice from the following people who are interested as possible buyers of the following materials: C. E. Chandler, Eureka, Kas., cement; J. W. Schwartz, Shenandoah, Ia., cement and stone; Frank D. Burckhard, Clarinda, Ia., cement and crushed rock; J. G. Partch, Concordia, Kas., Portland cement; E. S. Bowen, Garner, Ia., lime and cement; B. F. Bell, Newcastle, Ind., street paving blocks; W. J. Gilmore, Tipton, Ia., cement; Gray & Stewart, Portland, Ind., cement; Allen & Allen, Washington, Ind., cement; George W. Miller, 802 Equitable Bldg., Des Moines, Ia., cement; George W. Powell, box 40, Warren, Ind., brick, stone and cement; Adam Jess, jr., Pennsgrove, N. J., cement in fifty-barrel lots; E. A. Randall, lock box 36, Cedar Falls, Ia., Portland cement; H. C. Friend, 813 E. Lexington-ave., Ashland, Ky., cement; E. Kenney, Creston, Ia., broken stone, gravel and cement; W. F. Dallison, Bedford, Ia., cement and brick; J. M. King, Ashland, Ky., general builder's supplies; W. H. Faulkner, Fairfield, Ia., cement and crushed stone; John Pro, Spencer, Ia., cement, lime, stone and brick; Frank Ferren, 1319 Fourteenth-st., Des Moines, Ia., cement in car lots; W. E. Junker, Princeton, Ind., lime and cement; R. B. Bonce, Great Bend, Kas., all kinds of cement; R. G. Jacobs, Flemingsburg, Ky., sand and cement; W. A. Steed, Newnan, Ga., street paving and road constructing materials; Bloomington Concrete Co., 305 W. Washington-st., Bloomington, Ill., combined curb and gutter; J. W. Clark, 915 Hester-ave., Centralia, Ill., cements and brick; John Kellie & Co., 702 Michigan-ave., Detroit, Mich., cements; J. H. McCulloch, 1014 Marshall-st., cement and sand; Fuller Bros., Frostburg, Md., cement, lime, sand, brick and stone; Gabriel A. Chamblin, 254 N. Royal st., Mobile, Ala., cements; Springfield Hydraulic Stone Co., 10 Jackson-st., Springfield, Ill., Portland cement; Noah Bogard, 1400 E. Grove-st., Washington, Ind., Portland cement and crushed granite; F. T. Hardesty, Rock Falls, Ill., stone, brick and cement; Joseph Trompeter, Peru, Ill., cement, rock, sand, gravel and brick; J. A. Thornton, Morgan City, La., gray castings; Frost & Son, Jerseyville, Ill., cement and crushed granite; J. M. Stone, Ft. Madison, Ia., cement; Moran & Hardy, Lake Forest, Ill., cement; A. H. Beidelman, Naperville, Ill., cement; M. F. Murphy, Normal, Ill., cement, stone, sand and gravel; Lord Fuel and Ice Co., Monmouth, Ill., Portland cement. Joseph Hamilton, 605 Franklin-st., Wilmington, Del., cement—C. W. Sheatsley, 104 Grant-st., Niles, Mich., cement—D. W. Fuller, 22 Dwight-st., Springfield, Mass., cement, lime and brick—E. Miller, 902 Northwestern Bldg., Minneapolis, Minn. building materials—Clarence W. Coats, 727 Wisconsin-ave., Lansing, Mich., cement—A. D. Harrison, Little Falls, Minn., cement and lime—C. J. Stone, Kingsbury, Cal., cement and brick—J. H. Hansen, box 9, Wallace, Idaho, cement—Samuel Myrtelus, Wabasha, Minn., cement—Chas. Vogel, Wheaton, Ill., cement—John Sweeney, Hingham Center, Mass., all kinds of cements, stone, rough and finishing—H. N. Cagill, 532 Ottawa-st., Grand Rapids, Mich., cement paving and general concrete work—F. W. F. Woolicott, 5 Thornton-st., Winthrop, Mass., lime, cement, brick—R. P. Burgess, 51 Auburn-st., Reading, Mass., lime, cement, etc.—B. L. Ralph, Savannah, Mo., cements—Bagley & Bagley, Santa Rosa, Cal., cement, lime, brick, plaster—Congdon Construction Co., 313 Hennepin-ave., Chicago, Ill., Portland cement in large lots—Evan Smith, Monroe City, Mo., cement—Edward Ottoman, 306 S. Haven-st., South Haven, Mich., cement, lime, brick—C. K. Anderson, 605 E. Vine-st., Owatonna, Minn., lime, cement, brick, hollow tile, and all kinds of building materials—J. D. O'Connell, 424 Manhattan Building, Minn., cement.

MISCELLANEOUS.

The Artificial Paving Co., Syracuse, N. Y., has been incorporated to manufacture cement walks, by Wm. J. Burns, Wm. Spooner and Harry Osborne.

The Reliance Quarry & Construction Co., St. Louis, Mo., has been incorporated by Edward A. Hermann, Henry W. Hermann and Louis C. Hermann.

J. B. Duggan and others of Tacoma, Wash., are considering a plan for establishing plant to manufacture creosote paving blocks.

The Davenport Construction Co., Davenport, Ia., has been incorporated to do excavating, concreting, paving, or construction work, by C. G. Hipwell, F. H. Bartemeyer, C. C. Campbell and J. Britt.

The Concrete and Natural Stone Co., Chicago, Ill., has been organized to deal in artificial and natural stone, by James P. Grier, Wm. H. Tuttle and M. D. Cross.

The Allis-Chalmers Co., has absorbed the Bullock Electric Manufacturing Co., of Cincinnati. The business of the Bullock company will be conducted under the same management as heretofore, but under the general direction of the Allis-Chalmers company.

The Newark Artificial Stone & Plaster Co., Newark, O., has been incorporated by A. R. Pilser, Eli Hill, F. T. Mercer, John McNamara, C. E. Cochran, E. R. Hackney and B. F. McDonald.

The Jackson Cement Sewer Pipe Co., Jackson, Mich., has been incorporated, with Edward F. Lowery as president, John M. Phalen, vice-president; Andrew J. Meade, secretary and treasurer.

Recent Inventions.

730,212, June 2, 1903. Machine for Molding Building Blocks or Artificial Stone. C. H. Hutchings, Toronto, Canada. The block is made, the core to produce hollows is removed, the mold box is turned onto a removable side, and unlocked. The ends and front side of the mold box, hinged to the bottom, are turned out and up and the block is drawn out on a carriage; the apparatus is all carried on a suitable frame.

730,518. Jan. 9, 1903. Filtering System. F. A. W. Davis, Indianapolis, Ind. Impervious bottoms with depressed channels, many closely arranged transverse channels to collect filtered water, covered with perforated covers on which the filtering material rests, covered clear water basins between the filters with walls as described and raw water basins at ends.

730,588. Jan. 9, 1903. Method of Extracting the Residuary Matters from Sewer Water. Emile Vial, Brussels, Belgium. Sewage with one chemical added falls into shallow basin of large area where another chemical is added. Liquid is drawn off and residue is dried.

730,630. June 9, 1903. Manufacture of White Cement. Otto Friz, Nuremberg, Ger. Lime and clay as free as possible from iron, with porcelain frits burned approximately to the fusing point.

730,780. June 9, 1903. Building Wall and Concrete Block for Same. O. U. Miracle and W. L. Dow, Sioux Falls, S. D. A wall built of blocks with two parallel rows of air cavities separated and surrounded by concrete, the necks between cavities being strengthened by wire cloth.

730,817. June 9, 1903. Catch-Basin. Martin Cullen, Boston, Mass. A catch-basin overflowing through trap into overflow basin and having also a drain door, tapering to open easily through the sediment in the basin and a small clean-out conduit at the bottom.

731,032. June 16, 1903. Garbage Crematory. J. A. Forsyth, Atlanta, Ga. A furnace having combustion chamber with arched roof, on which garbage is deposited, a boiler partly over the outlet of the combustion chamber and serving to deflect the gases to the garbage, also a second independent fire to help heat the boiler, gases going out in same way.

731,323. June 16, 1903. Machine for Molding Hollow Concrete Building Blocks. Harmon S. Palmer, Washington, D. C. An addition to the removable bottom plate of the Palmer machine, when width of blocks is increased, of an auxiliary filling-strip having webs or ribs for filling the spaces, also of strip for forming a water table on the block, of removable division plates for molding slabs, nested cores, improved core carrier, etc.

731,246. June 16, 1903. Water Purifier. Elvi Delmonly, Paris, France. Water tank with two measuring compartments alternately delivering to mixing tank by means of an oscillatory double water wheel, and a chemical distributor operated by each discharge.

731,468. June 23, 1903. Apparatus for Softening or Otherwise Chemically Treating, Filtering and Storing Water. F. B. Leopold, Cincinnati, O. A housing with pure water storage tank in upper portion, platform above, primary receiving tank thereon, tanks of chemicals in solution, mixing trough and tank, wheel operating moving parts, settling chamber, filter, connecting pipes and valves, outlet for treated water.

731,595. June 23, 1903. Concrete-Steel Sidewalk. William Mueser, New York, N. Y. A concrete-steel sidewalk centrally supported on the spandrel wall of a bridge or viaduct and engaging therewith through offsets in the two and anchored by bars embedded in both.

731,608. Jan. 23, 1903. Process of Manufacturing Artificial Stone. William Owen, Woking, Eng. Mixing 15 per cent. of 40-50 mesh sand with 85 per cent. 70-75 mesh lime, dry, submitting to vapor at low pressure, then to high pressure steam, then drying and admitting hot carbonic gas and moisture.

731,612. June 23, 1903. Fence-post. V. E. Randall, Burlington, Mich. Cement post with special dseigns of metal strips for fastening fence wires.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Sycamore, Ill.—The Federal Asphalt Paving Co., of Chicago, which has the contract for paving in this city, is getting its plant in readiness to begin asphalt paving as soon as the weather will permit, according to press reports of March 2.

Washington, Pa.—A recent issue of bonds, amounting to $82,000, for paving and park improvements, is invalid and the successful bidders, a Philadelphia firm, refuse to accept them. The ballots were prepared according to the act of 1874 and not in accordance with the act of 1903.

CONTEMPLATED WORK.

Barre, Vt.—Some paving is contemplated.

Worcester, Mass.—Salem and Cambridge-sts. will be paved.

Dallas, Tex.—Asphalt paving is contemplated for Worth-st.

Walla-Walla, Wash.—Paving is proposed for Alder and Main-sts.

Kearny, N. J.—The macadamizing of Chestnut-st. is contemplated.

Kenton, O.—An ordinance has been passed for paving E. Franklin-st.

Tuscaloosa, Ala.—Paving is contemplated for the principal streets.

Fremont, Neb.—Brick paving is contemplated for Fifth, Main and F-sts.

Elysian, Minn.—The question of building cement walks is being agitated.

Xenia, O.—The improvement of Detroit-st. is contemplated. City Engineer McKay.

Fort Plain, N. Y.—This town voted March 15 to appropriate $5,000 for paving.

Sayre, Okla.—An ordinance is proposed providing for the building of sidewalks.

Woodbury, Conn.—Bids will be asked for soon for altering the Minortown-road.

Easthampton, Mass.—This town has appropriated $5,000 for macadamizing Main-st.

San Francisco, Cal.—Basalt block paving is contemplated for 1,453 feet of East-st.

Faribault, Minn.—The question of paving the business streets is being agitated.

Pekin, Ill.—The bd. of local impvts. has decided to pave a number of streets and alleys.

Atlanta, Ga.—Council has voted to improve twenty streets with chert, at a cost of $14,000.

Omaha, Neb.—Andrew Rosewater, cy. engr., has submitted the revised paving specifications.

Findlay, O.—Asphalt block paving is proposed for W. Sandusky-st., from Main-st. to Factory-st.

Effingham, Ill.—The question of street paving will be considered by the city council, March 22.

Ironton, O.—Brick or block asphalt paving is contemplated for Vernon and Washington-sts.

Youngstown, O.—A petition has been submitted to the B. P. S. asking that Valley-st. be paved.

Celina, O.—A petition is being circulated for paving Logan-st., from Main to the C., H. & D. railroad.

Malone, N. Y.—This village voted to expend $2,750 on improving the highways this summer. Vil. Clk.

Newcastle, Pa.—Plans have been completed and bids will be asked soon for building 2,700 ft. of road.

Albion, Ill.—The village council has decided to issue $3,000 bonds for building more brick sidewalks.

Kansas City, Mo—The council has authorized the repaving of Walnut-st. from Sixteenth-st. to Nineteenth-st. with asphalt.

Denver, Colo.—Specifications have been adopted for paving Welton-st. from Twenty-second-st. to Thirtieth-st. with asphalt.

Albany, N. Y.—Ordinances have been approved for paving Herkimer, Franklin, Division and Union-sts.

Grand Rapids, Mich.—Block asphalt for N. Union-st. and sheet asphalt for N. Prospect-st. are proposed.

Philadelphia, Pa.—Bids will be asked soon for repaving Delaware-ave., from Vine to South-sts. Dir. Costello.

Oakland, Cal.—Resolutions of intention have been passed for building cement sidewalks on certain streets.

Painesville, O.—The clerk of the B. P. S. has been authorized to advertise for bids for paving E. Main-st.

San Francisco, Cal.—Bituminous rock paving has been petitioned for on Corbett-st., from Seventeenth to Douglass-sts.

Springfield, Ill.—Paving is contemplated for an alley between Sixth and Eighth-sts., from Edwards to Cook-sts.

Anderson, Ind.—Petitions are being submitted to the City Council, asking that the streets be paved with brick.

Marion, Ind.—Asphalt paving has been petitioned for on Gallatin-st., from Third to Thirty-first-sts. Mayor Kiley.

Ft. Smith, Ark.—An ordinance has been adopted providing for the construction of sidewalks on certain streets.

West Palm Beach, Fla.—The question of issuing bonds for street paving and other improvements is being considered.

Naugatuck, Conn.—Bids for laying cobble gutters in this borough have been authorized. W. J. Neary, borough clerk.

Evanston, Ill.—Ordinances have been passed for paving certain streets and alleys with brick. John N. Moore, city engineer.

Argentine, Kas.—The Commercial Club is advocating the construction of a macadamized road from this city to Turner.

Mt. Holly, N. J.—This town voted, Mar. 22, to issue $15,000 bonds for paving two streets with vitrified brick.

Duluth, Minn.—The bd. of pub. wks. is preparing to let contracts for paving E. Superior, Second and First Ave. East.

Morgantown, N. C.—The town commissioners have decided to build concrete pavements with stone curbing on Union street.

Youngstown, O.—A petition is being circulated for paving Wilson ave. with Bessemer repressed brick with stone curbing.

Manchester, N. H.—Council has appropriated $15,000 for granite block paving on concrete foundation. H. P. Simpson, chm. st. and park comrs.

Washington, D. C.—Favorable reports have been made in the form of amendments to the District appropriation bill for paving 7th st. with asphalt.

Ithaca, N. Y.—Bids will be asked this summer for paving portions of Spencer, N. Aurora, Fall, Lake, Heustis and N. Tioga sts. and Dryden road.

Milwaukee, Wis.—The Milwaukee Monument company has made a proposition to the board of public works proposing to pave certain streets with granite.

Hamilton, O.—Buckeye st. from Front to 4th will be paved with block asphalt, sheet asphalt or vitrified brick. L. A. Dillon, cy. engr.

Painesville, O.—A committee, accompanied by H. P. Cumings, cy. engr., visited Warren, O., Mar. 15, for the purpose of inspecting asphalt block paving.

Ashland, Wis.—About 19,000 sq. yds. of macadam paving, 18,000 sq. yds of asphalt paving, and 15,000 lin. ft. of cement curb and gutter is contemplated this year. M. T. Doane, cy. engr.

Cincinnati, O.—The B. P. S. decided, March 17, to repair, under 1-yr. contracts at a stated price per sq. yd. for work actually done, all asphalt streets not under contract or ordered resurfaced.

Dayton, O.—Ordinances have been passed providing for grading and graveling Edgar ave., from Wyoming to Wayne; grading and paving with boulders, Dutoit-st. and an alley. C. Preston Floyd, clk. coun.

Perth Amboy, N. J.—An ordinance has been approved for paving Smith-st., from State to High, with asphalt on Telford macadam base and block gutters. Chas. K. Seaman, mayor; John F. Reilly, cy. clk.

Houghton, Mich.—A mass meeting of the taxpayers will be held early in April to consider the kind of material to pave Sheldon-st. with. William L. Miller, vil. prest., is reported as being in favor of creosoted blocks.

Newport, Ky.—The city council has authorized the improvement of a number of streets by original construction; brick paving with combined curb and gutter on Central-ave.; asphalt paving on Fourth-st. east of Park-ave. Supt. pub. wks. Krebs.

Chillicothe, O.—Ordinances are proposed providing for paving Second-st. from Ohio & Erie canal to N. & W. tracks, with vitrified brick, asphalt or other material; Walnut-st. from Second to Fifth-sts. with vitrified brick, asphalt or other material.

Springfield, O.—An ordinance is pending providing for paving E. High-st. from Greenmount to Belmont-aves. with asphalt, asphalt block and bituminous macadam. The macadamizing of Fremont-ave. from Limestone to Clifton-ave. is also contemplated.

Charleston, S. C.—(Special) J. H. Dingle, cy. engr. says that the bd. of pub. wks. is discussing the matter of constructing 40,000 sq. yds. of brick paving and 5,000 sq. yds. of granite paving, but the time for receiving bids has not yet been determined.

Salt Lake City, Utah—(Special) L. C. Kelsey cy. engr. says bids will be opened about April 20 for 5,000 sq. yds. of asphalt or bituminous macadam paving on First-st. About 40,000 sq. yds. of asphalt paving on S. Temple-st. is also contemplated, but has not yet been ordered.

Little Rock, Ark.—An ordinance has been passed re-enacting the establishment of asphalt improvement district No. 1, which was made necessary reason of error in the ordinance passed Aug. 10, 1903. Ordinances were also passed for building concrete walks and curbing on certain streets. Mayor Lenon.

Brooklyn, N. Y.—The Brunswick board adopted resolutions Mar. 16 for granite paving on Crescent-st., between Liberty and Belmont-aves., and asphalt paving on Pine-st., between Fulton-st. and Ridgewood-ave., and Milford-st. from Atlantic to Pitkin-aves. The Flatbush and Bushwick boards are also considering the paving of Sherlock Place, between Atlantic and Herkimer, with asphalt.

CONTRACTS TO BE LET.

La Crosse, Wis.—Bids are asked until 2 p. m. April 2 for grading Seventeenth-st Board of Public Works.

Muncie, Ind.—Bids are asked until April 4 for improving sidewalks. R. G. Hickok, city clerk.

Minot, N. D.—Bids are asked until April 4 for building cement sidewalks. W. C. McHugh, city auditor.

Ft. Scott, Kas.—Bids are asked until April 4 for grading and paving Eddy-st. J. O. Brown, city clerk.

Frankfort, Ind.—Sealed bids are asked until 3 p. m. April 4 for building two gravel roads. County Surveyor.

East St. Louis, Ill.—Bids are asked un-

til April 2 for 5,850 square yards of paving on Ohio-st. City Engineer.

Washington, Ind.—Bids are asked until April 5 for building twenty-six miles of rock road in Bar Township. County Commissioners.

Pacific Grove, Cal.—Bids are asked until May 9 for 5,269 square yards of paving. E. B. Lewis, City Clerk.

Lima, O.—Bids are asked until April 3 for grading, curbing and paving Pine-st. O. J. Rose, Clerk B. P. S.

Oshkosh, Wis.—Bids are asked until April 15 for grading and granite top macadam on Merritt-st. Board of Public Works.

Cincinnati, O.—Bids are asked until April 5 for repairing asphalt pavements on several streets. B. P. S.

Portland, Ind—Bids are asked until April 4 for building a free gravel road in Noble twp. Jay Griffith, engr.

Chester, Pa.—Bids are asked until April 4 for curbing and paving. S. B. Pennington, chmn, com. on sidewalks.

Bowling Green, O.—Bids are asked until April 12 for grading, draining and macadamizing 3 sections of road. Co. Comrs.

Jacksonville, Fla.—Bids are asked until April 6 for paving about 5 mis. of county roads. P. D. Cassidy, clk. co. comrs.

Georgetown, Del.—Bids are asked until 12 m. April 5 for building macadam road. Chas. G. Fisher, engr.

Woonsocket, R. I.—Sealed bids are asked until 4 p. m. April 7 for paving Main and Cumberland sts. F. H. Mills, cy. engr.

Kansas City, Mo.—Sealed bids are asked until April 4 for paving a large number of streets with asphalt. D. W. Pike, cy. engr.

Maywood, N. J.—Bids are asked until April 4 for macadamizing and guttering Park, Grove, Hunter, Central aves. and Elm st. Coun.

Winfield, Kas.—Bids are asked until 5 p. m. April 4 for curbing both sides of 9th ave. with concrete. Earl M. Hartley, cy. clk.

Paoli, Ind.—Sealed bids are asked until 2 p. m. April 6 for constructing 3 gravel or macadam roads. Geo. W. Tegarden, co. audt.

Norfolk, Va.—Sealed bids are asked until 12 m. April 15 for about 2,600 sq. yds. of asphalt paving. B. G. Tunstall, chmn. st. bd.

Stevens Point, Wis.—Sealed bids are asked until 12 m. April 14 for improving Clark and S 3d sts. Thos. A. Humphrey, chmn. B. P. W.

Bradford, Pa.—Bids are asked until April 11 for paving 5 streets with vitrified brick, concrete foundation, etc. A. F. Bannon, Jr., cy. engr.

Escanaba, Mich.—Council has authorized about $50,000 worth of paving for this summer, but no definite steps have yet been taken toward doing the work.

West Bay City, Mich.—(Special.)—H. C. Thompson, cy. engr., says that 44,000 sq. yds. of asphalt or brick paving on concrete foundation is contemplated.

Fall River, Mass.—An ordinance has been passed providing for 14,000 ft. of granite curbing and 225,000 granite paving blocks. F. A. Thurston, supt. sts.

San Jose, Cal.—Plans and specifications are being prepared for paving Virginia-st., with gravel with artificial stone sidewalks and curbing. Cy. engr. Pipper.

San Francisco, Cal.—The Harbor comn. is considering the improvement of the water front by constructing a basalt block roadway 1,453 feet length.

Minneapolis, Minn.—The paving committee decided March 16, on considerable creosoted wood block, sandstone, vitrified brick, macadam, and cedar block paving.

Milwaukee, Wis.—Asphalt paving has been recommended for Brady-st. from Farwell-ave. to Prospect-ave., and brick paving for portions of Brady, Johnson and Park-sts.

Cincinnati, O.—Resolutions have been passed to improve Lawrence, McAllister, Eighth, Plum and Clark-sts. with asphalt, Smith-st. with granite, and Buchanan-st. with brick.

Baltimore, Md.—Mayor McLane has approved ordinances for paving Grove-st. with vitrified brick, Twenty-first-st. with coblestone and macadamizing Walbrook-ave.

Massillon, O.—(Special.)—Harold Howald, cy. engr., says that bonds will be sold April 15, and bids asked soon thereafter for 44,817 sq. yds. of brick paving on gravel foundation.

Albany, N. Y.—Ordinances have been passed for paving Franklin-st. from Madison-ave. to Gansevoort-st.; Herkimer-st. from S. Pearl to Broadway; Division-st. from S. Pearl to Broadway.

Rosedale, Kas.—The city council passed an ordinance March 15, authorizing the paving of the Southwest boulevard. Paving is also contemplated for all the principal streets this summer.

Elizabeth, N. J.—Bids are asked until April 15 for paving Front and S. Park-sts. with trap rock, with new curbing. W. H. Luster, cy. clk.

Mt. Vernon, N. Y.—Bids are asked until 8 p. m. April 5 for laying flag walks, cross walks and curbing for ensuing year A. W. Reynolds, cy. clk.

Ithaca, N. Y.—Bids are asked until April 6 for macadamizing 5 streets and paving Heustis and N. Tioga-sts. with brick. John Miller, cy. clk.

Elgin, Ill.—Bids are asked until April 5 for 2,600 sq. yds. vitrified brick paving on 5-in. cement base. A. H. Hubbard, prest. bd. local impvts.

Topeka, Kas.—Bids are asked until 5 p. m. April 4 for completion and construction of condemned sidewalks and others ordered. J. H. Squires, cy. clk.

Mobile, Ala.—Sealed bids are asked until April 20 for asphalt, granite block, vitrified brick and wooden block paving. C. L. Lavretta, prest. B. P. W.

Winnipeg, Man.—Sealed bids are asked until April 12 for supplying 500 to 1,000

tons of asphalt and 15,000 to 25,000-bbls. of cement. C. J. Brown, cy. clk.

Columbus, Grove, O.—(Special) Sealed bids are asked until April 16 for 6,393 sq. yds. of brick street paving on stone foundation. O. C. Talbot, engr., Ottawa, O.

Opelousas, La.—Bids are asked until April 15 for 3,700 ft. cement walk, with brick curbing, and 9,000 ft. brick walk with brick curbing. B. A. Littell, mayor.

Columbus, Ind.—Sealed bids are asked until 1 p. m. April 4 for building 1-mi. and 3,744 ft. of gravel road between Jackson and Wayne twps. Wm. A. Morris, co. audt.

Oshkosh, Wis.—(Special)—Bids will be received until April 4 for 8,000 sq. yds. of macadam paving and gutter and curbing on Evans-st. Geo. H. Randall, cy. engr.

Hasbrouck Heights, N. J.—Sealed bids are asked until 8 p. m. April 4 for furnishing and laying flag, curb, gutter and macadam on certain sts. G. H. Ramsden, boro clk

Salem, N, J.—Sealed bids are asked until April 13 for grading and placing oyster shell surface on Salem and Pennville road, about 6 mis. Wm. J. Freas, dir. freeholders.

South Bend, Ind.—Bids are asked until 6 p. m. April 4 for grading, curbing and cement walks in town of River Park. J. B. Walker, chmn. bd. town trustees, River Park.

West Bay City, Mich.—Bids are asked until 7:30 p. m. April 11 for brick or asphalt paving on Washington-st., from C., S. & M. Railroad crossing to Patterson-ave. Cy. clk.

St. Louis, Mo.—Sealed bids are asked until 12 m. April 5 for completing the government road between Springfield, Mo., and the National Cemetery. Major Thomas Cruse, Depot Q. M.

Chicago, Ill.—Sealed bids are asked until 2:30 p. m. April 20 for furnishing and delivering filling required for Grant Park, 3,000,000 cu. yds. E. G. Shumway, secy. South Park Comrs.

Augusta, Ga.—Sealed bids are asked until April 12 for resurfacing Broad-st., from Fifth to Twelfth, with asphalt, brick, small Belgian block or macadam. Nisbet Wingfield, cy. engr.

Davenport, Ia.—Sealed bids are asked until 2 p. m. April 5 for vitrified brick paving on concrete base on Rock Island, Perry and Main-sts., Tremont-ave. and an alley. Thomas Murray, cy. engr.

Washington, D. C.—Sealed bids are asked until 12 m. April 5 for furnishing, at navy yards, League Island, Pa., vitrified paving blocks, c. i. pipe, fittings, gate valves, etc. H. T. B. Harris, paymaster-general U. S. N.

Muskegon, Mich.—Sealed bids are asked until 10 a. m. April 11 for furnishing and delivering 1,500 to 2,000 cu. yds. Bank gravel suitable for road building purposes at Mona Lake Station. John B. Barlow, clk. bd. co. road comrs.

Versailles, Ind.—Sealed bids are asked until 1 p. m. April 5 for constructing 22 mis. and 1,685 ft. of macadamized roads in Adams twp. and 13 mis. 1,642 ft. in Shelby twp. John Bultman, chmn. co. comrs.; Nicholas Volz, co. audt.

Sullivan, Ind.—Sealed bids are asked until 11 a. m. April 5 for building 3 mis. and 3,886 ft. of gravel or macadam road in Fairbanks twp.; 3 mis. and 1,460 ft. in Jefferson twp.; 6 mis. and 1,076 ft. in Gill twp. J. M. Lang, co. audt.

Cortland, N. Y.—Sealed bids are asked until 8 p. m., April 4, for 7,350 sq. yds. of macadam and 4,050 sq. yds. of brick paving, 7,000 lineal ft. stone curb and header, 50 cu. yds. concrete, and 1,000 lbs. cast iron. S. S. Knox, president board public works.

Meadville, Pa.—Sealed bids are asked until April 6 for 360 sq. yds. brick paving, 390 lin. ft. curbing, and 16 lin. ft. edge stones, on Mulberry-alley, also for 258 sq. yds. of brick paving on Cherry-alley. A. C. Pardee, city clerk.

Ridgefield Park, N. J.—Sealed bids are asked until 8 p. m., April 11, for 12,600 sq. yds. of Telford macadam and 20,000 sq. yds. of macadam paving, 18,000 sq. yds. excavation, 48 manholes brought to grade, and 1,600 sq. ft. cross bridge relaid. John DeGroat, village president.

Woodruff Place, Indianapolis, Ind.—Sealed bids are asked until 8 p. m., April 8, for paving the north side of Michigan-st., from the west to the east line of Woodruff Place, Marion County, with creosoted wooden blocks on 6-in. concrete base, with curbing. George Brown, president board of trustees. A. C. Thomas town clerk.

Indianapolis, Ind.—Sealed bids are asked until April 6 for paving Pennsylvania-st. from South to Merrill, with brick on 6-in. gravel concrete foundation. Until April 4 for paving Michigan-st. from Pogue's Run to Tacoma-ave. with creosoted wooden blocks. Until April 8 for cement sidewalks on portions of New York-st. and Woodlawn and Warman-aves., and grading and rolling Drexel-ave. M. A. Downing chairman board public works.

CONTRACTS AWARDED.

Little Rock, Ark.—The contract for paving Shell-alley with macadam was awarded March 18 to Charles Torbert.

Ithaca, N. Y.—Contracts for paving Stewart-ave. and W. Buffalo,st. have been awarded to Eugene McGreevy.

Washington, Ind.—The contract for building the Elnora gravel road was awarded to Hart & Anderson for $19,000.

Riverside, Cal.—The contract for paving Main-st., from First to Fifth, was awarded to McIntyre & DeGyrse for $7,678.47.

Meriden, Conn.—The contract for constructing a roadway in this city was awarded to Thomas Kearney, city, for $6,307.

Ft. Dodge, Ia.—The Barber Asphalt Paving Company has been awarded the contract for two miles of asphalt paving for $75,000.

Marion, Ind.—Modlin & Overman have been awarded the contract for building a gravel road in VanBuren Township for $6,295.

Beacon Falls, Conn.—The contract for grading and graveling a section of road was awarded to Frank Brazos of New Haven for $7,200.

Princeton, Ind.—The contract for constructing the Patoka rock road was awarded to Charles White & Co. of Booneville for $63,000.

Geneva, N. Y.—The contract for paving a number of streets with brick was awarded to Thomas Fitzgerald of Fredonia for about $30,000.

Cadillac, Mich.—The Central Bitulithic Company of Detroit was awarded the contract, March 21, for paving six blocks of Mitchell-st.

Utica, N. Y.—The contract for constructing bitulithic paving in certain streets was awarded, March 12, to Warren Bros. Company of Boston.

Hartford, City, Ind.—The contract for paving Jefferson, Main and High-sts. with brick was awarded, March 3, to Nolan & Slattery, at $1.72 a sq. yd.

Spokane, Wash.—The contract for paving First-ave., from Madison to Walnut, with asphalt, was awarded, March 13, to the Barber Asphalt Paving Company, at $3.41 a sq. yd.

Kansas City, Mo.—The Barber Asphalt Paving Company was awarded the contract, March 15, for paving Eighteenth-st. from Indiana to Jackson with asphalt, for $11,932.50.

Los Angeles, Cal.—The Fairchild-Gilmore-Wilton Company was awarded the contract for paving Fourth-st. from Main to San Pedro, with asphalt, according to local press reports.

McKeesport, Pa.—Bowman Bros. secured the contracts for paving Evans-ave. for $6,900, and Federal-st. for $7,500 and W. W. Kelly the contract for Stewart-st. for $8,150.

Natchitoches, La.—The contract for 4,400 sq. yds. of vitrified brick paving was awarded to the Miller Paving Company of Memphis, Tenn., at $2.33 a sq. yd.

Bay City, Mich.—The contract for paving Washington-st. with brick was awarded to W. J. Meagher, March 15, for $32,638, and for paving the crossings to R. Donohue, for $7,600.

Tacoma, Wash.—The contract for paving Pacific-ave. from 7th to 17th-sts. was awarded, Feb. 27, to F. A. Keasal, who will pave the street with vitrified brick for $48,967.

Muscatine, Ia.—(Special)—Brick paving contracts were awarded, March 3, as follows: Dist. No. 21, Davenport Const. Co., $63,375.05; Dist. No. 22, McCarthy Impvt. Co., $62,531.40.

Brooklyn, N. Y.—The Uvalde Asphalt Co. secured the contract, March 11, for 61,000 ft. of asphalt and surface repair work at $5 a cu. yd. for concrete work and 85c a sq. ft. for surfacing.

Grand Rapids, Mich.—Paving contracts have been awarded as follows: Ellsworth-ave., from Fulton-st. to Wealthy-ave., Albert Prange, $35,286.74; Grandville-ave., Wm. McDermott, $62,500. The streets will be paved with brick.

Chattanooga, Tenn.—Contracts for improvements at the new army post have been awarded as follows: Building chert roads and gutters, Wright, Wilburn & Wadley of Macon, Ga.; building Telford roads, Hall & Thompson, Hill City; building cement walks, Byron Souders.

Detroit, Mich.—The contract for supplying this city with asphalt was awarded, March 14, to the Warner-Quinlan Asphalt Co. of Syracuse, N. Y., at $25.50 per ton. The contract for furnishing cedar was awarded to Currie & Conn, at $9.42 for No. 1 and $6.75 for No. 2.

St. Louis, Mo.—Paving contracts were awarded, March 9, as follows: Fruin-Bambrick Const. Co., Page-boul., Park-ave., 13th and 18th-sts.; Gottlieb Eyermann, Maffitt-ave.; Granite Bituminous Paving Co., Boyle-ave. and three sections of Hickory-st.; Gilsonite Const. Co., Broadway-st.

Davenport, Ia.—The contracts for brick paving were awarded, March 15, as follows: Leonard, Washington and Locust sts., Davenport Construction Co., exca., 32 cts; paving, $1.65; curb, 52 cts; People's Construction Co., Fulton-ave., exca., 36½ cts; paving, $1.61; curb, 54 cts; 12th-st., exca., 40 cts; paving, 60 cts; curbing, 34 cts; 13th-st., exca., 38 cts; paving $1.60; curbing, 34 cts; 10th-st., exca., 35 cts; paving, $1.59; 16th-st., exca., 39 cts; paving, $1.62; curbing, 34 cts; Cedar Rapids Asphalt Co., Tremont-st., exca., 30 cts; paving, $1.93; curbing, 65 cts.

SEWERS.

Trenton, N. J.—Vice-Chancellor Grey decided March 15 to allow an order directing the city of Bordentown to abate a nuisance arising from the pollution by sewage of Thorntown Creek within one year. This case has been in the courts three years and was instituted by the congregation of the Mission of St. Vincent de Paul, of Bordentown, through the property of which the creek runs. The city will be compelled to build a new sewer.

CONTEMPLATED WORK.

Minonk, Ill.—A sewerage system is proposed.

Sheldon, Ia.—A sewerage system is advocated.

Newton, Ill.—A new sewerage system is urged.

Binghamton, N. Y.—A sewer in Pearl-ave. is proposed.

Madison, Me.—The construction of sewers is contemplated.

Parkville, Mo.—A sewerage system in sewer dist. No. 1 is proposed.

Shelbyville, Ind.—The construction of a large sewer is contemplated.

Eugene, Ore.—The extension of the Jefferson-st. sewer is contemplated.

Gardner, Mass.—This town has appropriated $4,500 for building sewers.

Cape Girardeau, Mo.—Surveys and estimates are being made for sewers.

South Bend, Ind.—Plans are being made for a larger sewer in South Bend-ave.

South Whitley, Ind.—The construction of a sewerage system is contemplated.

Marshfield, Ore.—A survey is being made for building a sewerage system.

Havre de Grace, Md.—Surveys for a sewerage system will be made. C. C. Pusey, mayor.

Marshfield, Wis.—Council will take action April 5 on the proposed North Side sewer.

Wilton, N. H.—A committee is considering the question of building a sewerage system.

storm sewers has been recommended by C. L. Huggins, cy. engr.

Batavia, N. Y.—This village voted to build a sewerage system at a cost of $300,000 to $375,000.

Zanesville, O.—A resolution has been adopted to build a storm sewer in Market-st., from Underwood to McOwen.

Lansing, Mich.—The construction of sewers in Isaac and Cedar-sts. and Capitol-ave. is contemplated.

Charleston, S. C.—The question of improving the sewers or constructing a modern system is being urged.

Belleville, Ill.—The estimated cost of the proposed intercepting sewer and septic tank system is $76,000.

Fresno, Cal.—The extension of the outfall sewer and erection of a septic tank is contemplated. Mayor Stephens.

Kenton, O.—The city engineer has been directed to prepare plans and specifications for a sewer in Waldeck-st.

Covington, Ind.—Bids will probably be asked in May for building sewers and pavements. W. H. Miles, city engineer.

San Francisco, Cal.—City Engineer Grunsky has recommended that this city expend $67,750 for new sewers this year.

Long Branch, N. J.—The Long Branch Sewer Co. contemplates the construction of a new outlet pipe about 1,000 ft. long.

Louisville, Ky.—Surveys for sewers in the southwestern part of the city have been made by J. B. F. Breed, city engineer.

Sterling, Ill.—The question of building a modern sewerage system is still being agitated, at a cost of about $500,000.

Lansing, Mich.—The city engineer has been directed to prepare plans for a sewer in Isaac-st., from Walnut-st. to the river.

Platteville, Wis.—(Special)—Phil. D. Hendershot, city clerk, says a plat is being made and a sewerage system is contemplated.

Buffalo, N. Y.—(Special)—A resolution has been adopted to build a 12 and 10 in. tile sewer on Southside Parkway and Tifft-st.

Lewiston, Idaho.—(Special)—J. O. Maxon says this city's sewer is about completed and plans will be made soon for the new system.

Chillicothe, O.—Ordinances have been passed providing for the construction of storm sewers in Hickory and Walnut-sts.

Jackson, Ky.—A sewerage system is contemplated and bids will be desired soon for 10,000 ft. of sewer pipe. A. C. Barrow, cy. engr.

Fitchburg, Mass.—A special committee has been appointed to consider plans for completing the sewage disposal works. J. W. Merrian, chmn.

Houston, Tex.—The question of issuing $650,000 bonds for constructing a complete sanitary and storm sewerage system will be voted on June 27.

Chattanooga, Tenn.—The question of building a sewerage system to relieve that part of the city lying in the manufacturing district is being considered.

Columbus, O.—An ordinance has been passed providing for erecting, equipping and operating a sewage disposal testing station. Geo. D. Jones, prest. coun.

Portland, Ore.—Bids will be asked at once for constructing the proposed new Brooklyn main sewer, which will drain a region of about 3 sq. mis. in extent.

Rochester, N. Y.—The ordinance providing for a 70-ft. tunnel to carry the overflow in times of flood was favorably reported on Mar. 15. E. A. Fisher, cy. engr.

Alma, Mich.—(Special) G. S. Young, vil. prest., says that this village will construct 1½ mi. of sewers. Plans for the same are being made by J. G. Chase, cy. engr.

Minneapolis, Minn.—The cost of constructing concrete steel sewers, in comparison with the present brick construction, is being considered by Carl Ilstrup, city sewer engr.

Mansfield, O.—(Special) Bids will probably be received some time in June for constructing 6,000 lin. ft. of trunk and main sewers, and about 3,000 ft. of laterals. Cy. engr. Keith.

Aberdeen, S. D.—The question of issuing $150,000 sewer and water bonds will be voted on April 19. The sewer plans involve the construction of a septic disposal tank system and beds.

St. Louis, Mo.—Sewer comr. Valliant has decided to try septic tanks in the disposal of sewage from a district bounded by Loughborough ave., Iron st., Michigan ave. and Carondelet Park.

Brooklyn, N. Y.—The Bushwick board has adopted resolutions to construct sewers in Stanhope and Crescent sts. The Flatbush board has adopted resolutions to build sewers in E. 31st st., Greenwood ave., Canarsie ave., E. 29th and E. 28th sts.

Philadelphia, Pa.—Plans are being considered which provide for the construction of large intercepting sewers along the line of the Schuylkill and Delaware rivers, converging at a point where the rivers join, and here the septic tanks will be erected to receive the sewage.

CONTRACTS TO BE LET.

Paola, Kas.—Sealed bids are asked until April 5 for building an 8-in. lateral sewer. Cy. engr.

LaCrosse, Wis.—Sealed bids are asked until April 20 for improving the sewerage system. B. P. W.

Grand Rapids, Mich.—Bids will be received until May 6 for constructing the

West Side trunk sewer. L. W. Anderson, cy. engr.

West Carrollton, O.—Bids are asked until 12 m. April 4 for building a village sewer. Vil. clk.

Mansfield, O.—Bids are asked until April 16 for building 6,000 ft. of lateral sewers. Cy. Engr. Keith.

Perth Amboy, N. J.—Bids are asked until April 4 for reconstructing Washington st. sewer. Matt Weirup, st. comr.

Kinston, N. C.—Bids are asked until April 18 for building about 5 mis. of 8 to 22-in. sewers. N. J. Rouse, mayor.

Columbus, Ind.—Bids are asked until April 12 for constructing 2,195 ft. of brick and 6,874 ft. of pipe sewers. W. H. Rights, cy. engr.

Trenton, N. J.—Sealed bids are asked until April 5 for building sewers in Monmouth, 2nd and Clark sts. H. B. Salter, cy. clk.

Des Moines, Ia.—Bids are asked until April 12 for building 4,660 ft. of sewers in 7th, Parnell and Bowman ave. B. O. Hanger, chmn. B. P. W.

Salt Lake City, Utah—Bids are asked until April 6 for constructing 16,600 lineal feet of eight, ten and twelve-inch pipe sewer. L. C. Kelsey, City Engineer.

Elizabeth, N. J.—Bids are asked until April 15 for building a sewer, with manholes, in Amity-st. W. H. Luster, City Clerk.

Cincinnati, O.—Sealed bids are asked until April 9 for constructing a masonry drain on Red Bank road, Columbia Township. E. L. Lewis, County Auditor.

Laporte, Ind.—Bids are asked until April 11 for building 2,300 feet of sewers in Niles, Woodward and Ridge-sts. C. E. Wolfe, City Clerk.

Glassport, Pa.—Bids are asked until April 11 for building a brick sewer in Ninth-st. and a terra cotta sewer in Cherry-alley. P. S. McMullen, Borough Engineer.

Chicago, Ill.—Sealed bids are asked until April 6 for constructing house drains in eighteen streets and systems of streets. A. M. Lynch, President Board of Local Improvements.

Washington, D. C.—Sealed bids are asked until April 23 for furnishing gate valves for the sewerage pumping station. H. B. F. McFarland, Chairman District Commissioners.

Edwardsville, Ill.—Sealed bids are asked until April 4 for building a sewerage system, with manholes, catch-basins, etc. H. P. Hotz, President Board of Local Improvements.

Chicago, Ill.—Sealed bids are asked until April 7 for a sewer and septic tank at the St. Charles Home for Boys. R. S. Tuthill, President Board of Trustees, 602 LaSalle-st.

Menominee, Mich.—Sealed bids are asked until April 7 for constructing sewers in Williams, Marinette and Baker-aves., and Maud and Parmenter-sts. F. S. Norcross, City Clerk.

Hackensack, N. J.—Sealed bids are asked until April 4 for constructing about 1,572 feet of two-foot brick sewer, sixteen manholes and nine catch-basins. Jacob Bauer, President Improvement Committee.

Oshkosh, Wis. (special)—Bids are asked until April 4 for constructing 3,700 lineal feet of eighteen, fifteen and fourteen-inch pipe sewers on Fourteenth and Fifteenth-sts. and Prospect-ave. George H. Randall, City Engineer.

Birmingham, Ala.—Sealed bids are asked until April 7 for constructing sections 6, 7, 8, 9 and 10 of the Valley Creek sewer. R. B. Smyer, Linn building, Secretary Jefferson County Sanitary Board; Julian Kendrick, Chief Engineer.

Bay City, Tex.—Bids are asked until April 2 for building 2,971 feet of fifteen and 1,890 feet of twelve-inch storm sewer, with necessary inlets; 6,922 feet of brick gutter; 6,762 feet of cypress curbing. W. M. Holland, Mayor.

Rockford, Ill.—Sealed bids are asked until 11 a. m. April 4 for constructing the Prairie and Eighth-st. sewerage systems and sewers in Eleventh and Fourteenth-aves., and Eleventh, Charles, N. Second, Benton and East-sts. Charles E. Jackson, President Board of Local Improvements.

Butler, Ind. (special)—Bids are asked until May 2 for building a sewerage system, including 41,775 feet of 60, 36, 30, 24, 18, 15, 12, 6 and 4-inch sewers; 60 manholes, 200 pipe catch-basins, 800 lot specials, 35 pipe lampholes, 25 pipe flushing holes. J. H. W. Krontz, City Engineer.

CONTRACTS AWARDED.

Newport, Ky.—The contract for building a sewer in Arnold-alley was awarded to Fred McLane.

Kearny, N. J.—William Green was awarded the contract for building a sewer in Bergen-ave. for $1,060.

Asheville, N. C.—J. R. Rich & Son secured the contract for building a sewer in Catawba-st. for $233.15.

Casper, Wyo.—The contract for constructing a sewerage system was awarded to O'Brien & Rhoades of Denver for $11,137.

Terre Haute, Ind.—The contract for constructing a 12-in. sewer on Eighth and Spruce-sts. was awarded to Donn Roberts for $1,894.35.

St. Paul, Minn.—Christ Johnson was awarded the contract for building a sewer in S. Robert-st. from Morton to Dearborn for $3,266.

Atlantic, Ia.—The contract for constructing a sewerage system has been awarded to W. A. Edgar of Cedar Rapids, Ia., for $11,950.

Buffalo, N. Y.—(Special)—The contract for a 20, 18, 15 and 12-in. sewer in Humason-st. was awarded to Frederick J. Mumm for $2,349.

Scranton, Pa.—The contract for constructing sec. G of the 17th sewer district was awarded to Egli & Co. of South Scranton for $53,000.

Kansas City, Mo.—Kinlan & McCarthy secured the contract for building an ex-

tension to the sewer in district No. 249 in Westport for $18,430.

Muscatine, Ia.—Contracts for constructing sewers in Dists. Nos. 1 and 3 were awarded to Peter Weingerter for $924.85 and $1,044, respectively.

West Hartford, Conn.—The Hartford Paving and Construction Co. of Hartford secured the contract for constructing the Charter Oak district sewers for $11,475.35.

Nashville, Tenn.—The contract for extending the sewer from the cotton factory to the Cumberland River has been awarded to the Nashville Plumbing Co. for $8,233.75.

Milwaukee, Wis.—Sewer contracts have been awarded as follows: 1,009 ft. brick sewer in 31st-ave., Herman Hohensee, $7.47 a ft.; 333 ft. sewers in Muskego-ave., C. J. Crilley, $1.77 a ft.

Economy, Pa.—The contract for building a sewerage system has been awarded to Thos. Sweeney & Son, for $30,000. Press reports state that the contract for manholes and drops will increase the contract price to $45,000 or $50,000.

Atlanta, Ga.—Contracts for sewer work during the year have been awarded as follows: Building sewers, A. J. Dunn; furnishing sewer pipe, Sciple & Sons; furnishing cement, Victor H. Kreigshaber; furnishing castings, Withers Foundry Co.

Taylorville, Ill.—(Special) A. B. Alexander, sec'y bd. local impvts., says contracts for a system of surface drainage in this city were awarded, Feb. 1, as follows: Two districts, M. Powell & Son, $8,088; one district, W. H. Bourne, $1,343; Northwestern sewer, Prendergast Construction Co., $11,352.15; enlargement of N. Market-st. sewer, M. A. Hogan, $2,069.30; Gustine-ave. sewer, McIntyre & Teese, $717.25; Delmar-boul., storm sewer, Prendergast Construction Co., $744; sewer inlets and connections, William F. Riley, $2,336.90; sewer in Rock Spring District No. 14, McIntyre & Teese, $31,162.45; sewer in Rock Spring District No. 15, McIntyre & Teese, $5,663.70.

WATER-WORKS.

Depew, N. Y.—Application has been made in the Supreme Court for a writ of peremptory mandamus to compel the Depew & Lake Erie Water Company to furnish this village with a supply of pure, fresh water in such quantities that it can be in condition to protect the lives and the property of the citizens of the village from conflagration.

CONTEMPLATED WORK.

St. Paul, Minn.—Water mains will be laid in a number of streets this year.

Mansfield, O.—(Special)—The installation of meters is contemplated. Cy. engr Keith.

White Plains, N. Y.—The question of installing new pumping plant is being considered.

Ft. Dodge, Ia.—The question of increasing and improving the water supply is being considered.

Bishop, Cal.—Plans for a municipal water works system have been submitted, according to press reports.

Petoskey, Mich.—This city will vote on a proposition to issue $22,000 bonds to extend the city water pipes.

Moline, Ill.—D. W. Mead, cons. engr., urges this city to put in a fifth filter bed at a cost of about $2,500.

Scottville, Mich.—This town voted to improve the waterworks system by adding a new pump, well and engine.

Lawrence, Mass.—Plans for additional filters for the water supply have been prepared. C. F. Lynch, mayor.

Menasha, Wis.—The question of acquiring municipal waterworks will be voted on April 5. S. S. Little, cy. clk.

Greenfield, Mass.—The water commissioners contemplate increasing the water supply by the addition of a new reservoir.

Madison, Wis.—John B. Heim, supt. of w w., recommends the construction of a storage basin in his annual report.

Kansas City, Mo.—Ordinances have been passed appropriating several thousand dollars for laying more water mains.

Wheeling, W. Va.—The expenditure of about $800,000 on water works improvements, gas and street work is contemplated.

Youngstown, O.—The B. P. S. has decided to ask for bids at once for the proposed filtration plant. F. M. Lillie, cy. engr.

Cleveland, O.—The question of voting on an issue of $2,000,000 bonds for erecting a filtration plant is being considered.

West Orange, N. J.—A resolution was passed March 22 recommending for consideration the acquiring of a municipal water plant.

Iowa Falls, Ia.—The water works system will be improved this year by new and better equipment and enlarging the works for general use.

The question of issuing bonds for building water works systems will be voted on at the following places: Klemme, Ia.; Waxahachie, Tex.; Atwater, Minn.

New York City—Commissioner Oakley of the department of water supply, gas and electricity has recommended 6 fresh-water pumping stations for fire protection.

Madisonville, Ky.—A map is being made of this city by J. E. Morgan of Chicago preliminary to preparing plans and specifications for a system of water works.

Milwaukee, Wis.—The extension of the water system of this city to Wauwatosa for the protection of the county institutions from fire has been recommended by Chief Meminger.

Emporia, Kas.—The city council is negotiating for the purchase of milldam and grove near here, preliminary to building a municipal water-works pumping station on the Cottonwood river.

Newark, O.—Andrew J. Crilly, mayor, has called attention to the fact that the time limited by the ordinance for the city to commence the erection of a municipal water-works system has expired.

Newark, N. J.—A resolution was passed

Mar. 3 directing the board of village trustees to appoint a committee to confer with a committee from the Newark Board of Trade to investigate the cost of constructing a water-works system, prior to making a new contract with the present company.

Wilmington, Del.—The water commission will secure data for furnishing this city with a good water supply, which will then be submitted to an engineer for his opinion before having plans made.

Massillon, O.—(Special)—Harold Howald, cy. engr., says preliminary legislation has been passed for constructing a new water plant, to cost about $200,000. The present plant is owned by a private company.

Charleston, S. C.—Plans and specifications have been approved for constructing the proposed dam at Goose Creek for the purpose of impounding the water and at the same time not closing the creek to navigation.

Buffalo, N. Y.—(Special)—The com'r. of pub. works has been directed to prepare plans and ask for bids for installing a 30,000,000-gal. electric turbine pump and the motor to drive it, at the water-works station.

Crawfordsville, Ind.—A resolution has been passed providing that great care be taken in the matter of making a new contract with the Crawfordsville Waterworks Co., and that the matter be carefully investigated.

The question of issuing water-works bonds for building water-works systems has been favorably voted on at the following places: Poland, N. Y.; Alpena, Mich.; Hays City, Kas.; Wiscasset, Me.; Brewster, Minn.; Fountain, Minn.

Columbus, O.—At a meeting of the B. P. S., March 21, Directors Bohl and Pond voted to restrict competition in bidding on the cement work for the new Scioto dam to cement manufacturers that have been in business at least five years.

Walla Walla, Wash.—The special water committee has recommended two plans for the proposed water-works system. One provides for installing a pumping plant at the Thomas ranch, four miles east of this city, at an estimated cost of $64,000, and the other is for a complete gravity system developed by tunneling at a cost of $90,000.

Columbia, S. C.—The water-works commission has submitted its report on the different available sources investigated for supplying this city with water and a new water-works plant. They report that a water supply can be secured from three sources, as follows: Congaree Creek, $647,210; Dent's Pond, $473,700; River, $399,890. The commission recommends the Congaree project.

The question of constructing waterworks systems is contemplated at the following places: Frederic, Wis.; Mountain View, Cal.; New Freedom, Pa.; Hebron, Ill.; Anderson, Cal.; Pitkin, Colo.; Lehi, Utah; Bedford, O.; Hinckley, Ill.; Corning, Cal.; Tiverton, R. I.; Lee, Ill.; Hubbell, Mich.; Post Falls, Idaho; Owensboro, Ky.; Dixfield, Me.; Ormstown, Quebec; Janesville, Mich.; Kulm, N. D.; Gleason, Tenn.

CONTRACTS TO BE LET.

Fargo, N. D.—Bids are asked until 5 p. m. April 4, for water main extensions. H. J. Gibson, cy. audt.

Kinston, N. C.—Sealed bids are asked until April 18 for constructing a waterworks system. L. J. Mewborne, clk.

Statesboro, Ga.—Sealed bids are asked until April 12 for constructing a waterworks system. G. S. Johnson, mayor.

Glenellyn, Ill.—Sealed bids are asked until April 22 for installing a water-works system. A. M. Kelley, vil. clk.

Ligonier, Ind.—Bids are asked until April 14 for erecting a power station at the water-works. H. Jeanneret, cy. clk.

Alexander City, Ala.—Sealed bids are asked until April 6 for constructing a waterworks system. A. P. Fuquay, mayor.

Salt Lake City, Utah.—Sealed bids are asked until April 6 for constructing 15,800 lin. ft. 6, 8 and 10-in. water mains. L. C. Kelsey, cy. engr.

Springfield, O.—Sealed bids are asked until April 9 for furnishing and erecting at the pumping station a pumping engine. B. P. S.

Mayfield, Cal.—Bids are asked until April 4 for furnishing casing and boring and completing one or more 10-in. wells. Bd. trustees.

Kennedy Heights, O.—Sealed bids are asked until April 9 for constructing a water-works system. J. M. Baker, clk bd. trustees pub. affairs.

Binghamton, N. Y.—Sealed bids are asked until April 4 for furnishing and installing a pumping engine. John Anderson, supt. water comrs.

Lethbridge, Alberta, Canada.—Sealed bids are asked until April 14 for pumping machinery and boilers for the waterworks. C. W. Bowman, secretary-treasurer.

Easton, Pa.—Bids are asked until April 5 for laying about 20,000-ft. of 2 to 4-in. c. i. pipe in the streets. Jos. S. Rodenbough, president Lehigh Water Co.

Stowe, Vt.—Sealed bids are asked until April 4 for laying 2 1-3-mis. c. i. water pipe and necessary gates, hydrants and specials. J. J. Vearen, chairman village trustees.

Dayton, O.—Sealed bids are asked until April 15 for furnishing and delivering 550 tons 6, 8, 10 and 12-in. water pipe with special castings. Louis Hass, president board public works.

Chicago, Ill.—Sealed bids are asked until April 7 for water service, deep well, boilers, engine, etc., for St. Charles Home for Boys. R. S. Tuthill, president, 602 La Salle-st.

Galveston, Tex.—Sealed bids are asked until April 10 for scouring out the 30 artesian wells of the Galveston city water works, located at Alta Loma, Tex. John D. Kelley, city secretary.

New Orleans, La.—Sealed bids are

asked until May 10 for furnishing 2 gasoline engines, 2 centrifugal pumps and 2 centrifugal pumps with motors. F. S. Shields, secretary sewerage and water board.

Toledo, O.—Bids are asked until April 4 for laying the proposed submerged 20-in. water main across the river from Walnut-st. to Main-st. to connect with a 20-in. main at that point. Board public works.

Harrisburg, Pa.—Bids are asked until April 13 for constructing the municipal filter plant, low-lift pumping station and conduit from island to city. M. B. Cowden, city engineer; A. C. Staun, secretary board public works.

CONTRACTS AWARDED.

Genesee, Idaho—Naylor & Norlin, of Lewiston, have been awarded the contract for installing a waterworks system in this city, for $14,000.

Bardstown, Ky.—The contract for building a water works system has been awarded to J. W. Doolittle & Son, of Corydon, Ind., for about $10,000.

Durant, I. T.—The contract for constructing a water works system was awarded Mar. 3 to H. C. Ullen, jr., of Oklahoma City, for $77,777.72.

East Orange, N. J.—The contract for building a 5,000,000-gal. emergency reservoir has been awarded to the Commonwealth Roofing Co., for $49,525.

Manila, P. I.—The contract for pumping equipment to be installed in the new water works has been awarded to the Gould Mfg. Co., of Seneca Falls, N. Y.

Cambride, O.—The contract for the proposed extension of the water works system has been awarded to W. C. Corcoran & Co., of Pittsburg, Pa., for $13,046.53.

Nashville, Tenn.—The contract for furnishing water pipe to this city has been awarded to the U. S. Cast Iron Pipe Co., of Chattanooga, Tenn., at $21.50 per ton.

Atlantic City, N. J.—The contract for increasing the capacity of the artesian well pumping plant at the Absecon station has been awarded to the Pneumatic Engine Co., of New York City, for $2,645.

Detroit, Mich.—The contracts for building the river tunnel shaft, and crib house has been awarded as follows: crib house W. J. Gawne Co., of Cleveland, $74,750; shaft and river tunnel, C. H. Fathe & Son, $112,194.

Buffalo, N. Y.—(Special) The Snow Steam Pump Co. has been awarded the contract for 3 horizontal centrifugal sewage pumps, together with 3 direct connected vertical compound condensing engines and auxiliary machinery required to drive them; also, the construction and erection of four 125-hp. boilers for sewage pumping plant on Main and Hamburg canal strip near Hamburg-st. The contract for the engines is $25,300 and for the boilers, $9,800.

BRIDGES.

Ackley, Ia.—A petition is being circulated for a bridge on S. Cerro Gordo-st.

Ontonagon, Mich.—A steel and stone bridge over Ontonagon River is contemplated.

Redding, Cal.—The Merchants' Club is urging the building of a new steel bridge across the river.

Wichita, Kas.—Bids are asked until April 18 for building 3 steel bridges. Hudson Bateman, clk.

Ogden, Utah.—City Council has voted to construct a viaduct across the railroad tracks on Twenty-fourth-st.

Liberty, Mo.—Bids are asked until May 3 for an iron and steel bridge over Coon creek. Bridge comr.

Green Bay, Wis.—City Council has ordered plans prepared for a bridge across East River at Webster-ave.

Rathdrum, Idaho.—Bids are asked until April 11 for building a Hoodoo Meadow bridge. T. L. Quales, co. clk.

Long Island City, L. I.—Bids are asked until Apr. 7 for a new bridge over Flushing creek. Comr. of bridges.

Steamboat Springs, Colo.—Bids are asked until Apr. 18 (extended from Apr. 8) for a bridge across Yampa river.

Bluffton, Ind.—Bids are asked until Apr. 6 for building several small county bridges. C. S. Brennemen, co. audt.

Howard, S. D.—Bids are asked until Apr. 5 for all steel bridges to be built during year. Frank Smith, co. audt.

Milwaukee, Wis.—Plans for the proposed new 5th-st. viaduct are being considered by the viaduct committee.

Richmond, Ind.—Cy. Engr. Weber has prepared 4 plans for the proposed bridge over the White Water river at S. H.-st.

New Richmond, O.—Bids are asked until April 11 for the superstructure of a bridge over Twelve-Mile Creek. H. P. Williams, County Auditor.

Chicago, Ill.—Bids for a new bascule bridge over the Chicago River at Harrison-st. will be received April 13. Drainage Board.

Primeville, Ore.—Bids are asked until May 9 for building a combination Howe truss bridge over Crooked Creek. A. J. Smith, County Clerk.

Ft. Smith, Ark.—Bids are asked until April 14 for building a steel bridge over Mill Creek on Wheeler-ave. road. W. A. Falconer, County Judge.

Delphi, Ind.—Bids are asked until April 4 for building three bridges with stone abutments and one arch culvert. Fred H. Engle, county auditor.

St. Clair, Nev.—Bids are asked until April 4 for building a wagon bridge over New River and for five small bridges. W. H. Brown, county clerk.

Newark, N. J.—Bids are asked until April 19 for building two concrete steel arch bridges at Park and Bloomfield-aves. Essex County park commissioners.

Mound City, Kas.—Bids are asked until April 8 for building a bridge over Twin

Spring Branch and one over Little Sugar Creek. J. A. Cady, county clerk.

Topeka, Kas.—Sealed bids are asked until April 4 for building a steel truss bridge on E. Eighth-ave. across the Shunganunga River. J. H. Squires, city clerk.

Versailles, Ind.—Sealed bids are asked until April 5 for the construction of a wagon bridge and abutments across Laghery and Plum creeks. Nicholas Volz

Hackensack, N. J.—Bids are asked until April 5 for stone abutments and a steel beam and brick arch on Grove-st. Walter Christie, chm. co. freeholders.

Lafayette, Ind.—Separate bids will be received April 7 for constructing an iron bridge and substructure over a creek near Hegman's farm. H. H. Cheny, co. audt

Elkhart, Ind.—Sealed bids are asked until April 12 for building stone abutments and an iron bridge over the Elk river in Concorn twp.; also five stone arches. O. H. Sweitzer, co. audt.

Saginaw, Mich.—Sealed bids are asked until April 7 for building a bridge across Saginaw river at Center-st. Also a bridge across Saginaw river at Maple-st., in the village of Carrollton. W. H. Barton, clk. B. P. W.

Hillsboro, Ill.—Sealed bids are asked until 8 p. m., April 19, for constructing a concrete spillway and bridge abutments approximately 310 cu. yds., of concrete, in this city. Geo. A. Clotfelter; Frank P. Winchester, cy. clk.

Cincinnati, O.—Bids are asked until April 16 for improving east approach of suspension bridge over White Water river in White Water twp. E. L. Lewis, co. audt.

Buffalo, N. Y.—(Special)—The common council will ask the Legislature to pass a bill giving this city permission to compel the railroad companies to substitute swing or draw bridges over the Buffalo river. The common council has also directed the commissioner of pub. works to award the contract for the substructure of the Evans-st. bridge to B. I. Crocker. 4 Bldrs. Exchange, and for the superstructure to McClintic-Marshall Const. Co., of Pittsburg.

STREET LIGHTING.

Cumberland, R. I.—A municipal lighting plant is proposed.

Ossian, Ia.—The question of building a gas plant will be voted on.

Livingston, Mont.—The question of an electric light plant is being considered.

Wilson, N. Y.—A company has been organized to light this city by electricity.

Kinston, N. C.—Bids are asked until April 18 for an electric light plant. N. J Rouse, mayor.

New Haven, Ind.—Bids will be received until April 5 for an electric light plant Town bd.

Clarion, Ia.—City council contemplates expending $6,000 in improving the electric light plant.

Burlington, N. J.—A special committee is ascertaining the cost of municipal electric light plant.

Lewiston, Pa.—Bids are asked until April 4 for thirty-five or more enclosed arc lights and 150 incandescent lights.

Cheyenne, Wyo.—Bids are asked until April 9 for electrical work at Ft. D. A. Russell. Capt. W. S. Scott, quartermaster.

Cheboygan, Mich.—Bids are asked until April 5 for wiring the city hall for electric lights. George M. Case, city clerk.

Statesboro, Ga.—Bids are asked until April 12 for constructing an electric light system. C. S. Johnston, mayor.

Waveland, Ind.—A 25 yr. franchise for a commercial lighting system has been granted the Johnson Acetylene Gas Co.

Bay City, Mich.—Question of issuing $50,000 bonds for additions to the electric plant will be voted on April 4.

Wheeling, W. Va.—The estimated cost of a gas plant is $40,000. City Engineer Cook has been directed to prepare plans.

Chicopee, Mass.—The citizens of Ward 7 have appointed a committee to consider the erection of a gas or electric light plant.

East Lake, Ala.—The question of issuing $13,500 bonds for an electric light plant will be voted on April 20. Mayor McKinley.

The question of constructing electric light plants has been voted on [illegible] following places: Watkins, N. Y.; Monticello, Wis.; Valatie, N. Y.

Chattanooga, Tenn.—The contract for installing an acetylene gas plant at Chickamauga Park has been awarded to the Acetylene Apparatus Manufacturing Company of Chicago.

Tarentum, Pa.—Citizens are discussing the advisability of expending from $25,000 to $30,000 in repairing the electric light plant and the adoption of a meter system.

Duquoin, Ill.—The city councils of this city and Pinckneyville contemplate erecting an electric light plant midway between the two towns to provide service for both.

San Antonio, Tex.—Bids are asked until April 6 for lighting the streets, plazas and alleys of this city with gas or electric lights for two years. John B. Campbell, Mayor.

The construction of electric light plants is contemplated at the following places: Papillion, Neb.; Litchfield, Utah; San Jose, Ill.; Bellevue, O.; Tallula, Ill.; Harmon, Ill.; Avoca, N. Y.; Escondido, Cal.; Sayre, Okla.

Pittsburg, Pa.—The contract for lighting the streets of this city during the current year has been awarded as follows: Allegheny County Light Company, arc lights, 2,000 c. p., $96 a light, and 50 c. p., $35 a light; 60 c. p. incandescent lamps, Cleveland Vapor Light Company at $25.90 a lamp and supplying incandescent lamps with plate burners at $19.50.

Brooklyn, N. Y.—Bids are asked until April 4 for a lighting plant for the Twenty-third Regiment Armory. George B. McClellan, Mayor. Bids are asked until April 23 for installing a turbo-alternator

with excitor set, 5 induction motors, 1 motor generator, 2 switchboards and accessories at Navy Yard pier. M. T. Endicott, Chief Bureau Yards and Docks, Navy Dept., Washington, D. C.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Chicopee, Mass.—Bids are asked until April 4 for collecting garbage for one year. R. D. DeWitt, secy. bd. health.

Mankato, Minn.—The board of health has directed the attention of the council to the need of a crematory for this city.

Galesburg, Ill.—Bids are asked until April 15 for hauling ashes and sprinkling streets during fiscal year. F. A. Freer, custodian.

Jackson, Miss.—(Special) The bd of aldermen has instructed Cy. Engr. W. T. Kirkpatrick to prepare plans and estimates for a garbage crematory.

Indianapolis, Ind.—Bids are asked until April 4 for sprinkling unimproved streets, avenues, alleys and public places from May 1 to Oct. 15, bids to be for 10,000 ft. of roadway. M. A. Downing, chmn. B. P. W.

Dunkirk, N. Y.—(Special)—The Dunkirk Sanitary Reduction Company has made a proposition to take care of all garbage and waste matter from houses and stores at rates varrying from 25 cents to $1. The company expects to build a reduction plant on Bennett road. The board of health has decided to advertise for bids and a five-year contract will be awarded L. E. Hubbard, prest. company.

Omaha, Neb.—Only two bids were re-incinerating garbage. One was an unsigned bid from the City Garbage Company. Based on 5, 10 or 15 year contracts, no bid being submitted for the one year contract. The other bid was from the International Fuel Company and proposed that the city shall build an incinerating plant according to the Engle design and pay to Andrew Engle 12 per cent if the plant costs less than $6,000, or 10 per cent if it costs $8,000 or more. Action on the bids was deferred.

PARKS.

Milwaukee, Wis.—A plan is being considered for establishing a park in Bay View.

New London, Conn.—Plans are being prepared for a new park covering an area of 11 acres.

Newport, Ky.—Sealed bids are asked until April 2 for improving McClure's Park. J. B. Morlidge, cy. engr.

Chicago, Ill.—A special commission will be appointed to acquire the great natural belt parks around this city.

FIRE APPARATUS.

Perth Amboy, N. J.—A special committee has been appointed to secure specifications for two fire engines.

TOO LATE FOR CLASSIFICATION

Huntsville, Mo.—This city voted to issue $18,000 for macadamizing the streets.

Marseilles, Ill.—An ordinance has been passed for paving the main street of this town.

Lorain, O.—Bids for asphalt paving on W. Erie-ave. and Dexter-st. will be asked.

Kansas City, Mo.—Sealed bids are asked until April 4 for brick paving in an alley.

Tiffin, O.—An ordinance has been introduced to pave Greenfield-st. from Market to Prospect.

Winamac, Ind.—Sealed bids are asked until April 12 for constructing roads. Ellis S. Rees, co. audt.

Frankfort, Ind.—Bids are asked until May 7 for constructing a gravel road. Geo. W. Alexander, supt. Wood gravel rd.

Moscow, Idaho—The city sewer committee has secured right of way for constructing a septic tank system of sewerage purification.

Cincinnati, O.—Sealed bids are asked until April 5 for repairing a large number of asphalt streets. Geo. F. Holmes, clk. B. P. S.

Kansas City, Mo.—Plans for a septic tank to be located in the southeast part of the city have been prepared by D. W. Pike, cy. engr.

Cadillac, Mich.—The contract for paving Mitchell-st. with bitulithic pavement has been awarded to the Central Bitulithic Co. of Detroit.

Richmond, Ind.—A declaratory resolution has been passed for building a cement walk on both sides of W. Main-st. and the south side of Kinsey-st.

Milwaukee, Wis.—Sealed bids are asked until April 2 for building sewers in the eastern and western districts. Chas. J. Poetsch, chm. B. P. W.

Edwardsville, Ill.—Sealed bids are asked until April 4 for constructing a sewerage system, with manholes, catch basins and appurtenances. H. P. Hotz, prest. bd. local impts.

Covington, Ky.—An ordinance has been passed for reconstructing Russell-st. from 12th to 15th. Creosoted wood block paving is proposed for Scott-st. from 12th to 18th. Cy. Engr. Gunn.

Houghton, Mich.—Bids for paving Sheridon-st. from Dacotah to Franklin-sts. will be received April 11, with creosoted wood blocks, vitrified brick or other paving, according to local press reports. Vil. Engr. Savicki.

Findlay, O.—The city engineer has been directed to prepare plans and specifications for paving E. Center-st. with vitrified block. An ordinance has been passed for paving Main-st. from West to Factory with asphalt blocks.

St. Louis, Mo.—Sealed bids are asked until April 8 for reconstructing Lindell-boul. from Grand-ave. to Spring-ave. and from Spring-ave. to Kings-highway by removing old pavement and laying macadam. Hiram Phillips, prest. B. P. I.